

A Review of the Genus *Cyclosomus* Latreille (Coleoptera: Carabidae: Cyclosomini) in the Afrotropical Region

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A comparative morphological study of nearly 300 specimens of *Cyclosomus* Latreille accumulated through loans has permitted recognition of six species in the Afrotropical Region and a seventh species, *C. flexuosus*, probably introduced into northeastern Africa from the Oriental Region. A key is provided for the identification of adults to species and the known geographical distribution of each species is summarized. Also included is discussion of geographical range patterns, sympatry, and syntopy in the fauna. Lectotypes are designated for nine species-group names (*C. basalis* Kolbe, *C. buquetii* Dejean, *C. destitutus* Dupuis, *C. equestris* Boheman, *C. madecassus* Fairmaire, *C. rousseaui* Dupuis, *C. rugifrons* Jeannel, *C. seineri* Kuntzen and *C. somalicus* Alluaud) and two new synonymies are proposed (*Cyclosomus buquetii somalicus* Alluaud as a junior synonym of *C. collarti* Burgeon and *C. rugifrons* Jeannel as a junior synonym of *C. equestris* Boheman). No new species are described.

KEYWORDS: Coleoptera, Carabidae, Cyclosomini, *Cyclosomus*, Afrotropical Region, distribution, key to species

Cyclosomus Latreille (1829) is a modestly diverse genus in the carabid beetle tribe Cyclosomini of subfamily Lebiinae, with only 13 described species at present (Lorenz 2005). The cumulative geographical range of included species is restricted to the Oriental and Afrotropical Regions. Members of all species in the genus share a common overall body form (as in Fig. 1) and all are basically pale in dorsal body color, with or without a variously developed pattern of dark areas on the pronotum and elytra. All observations of these beetles alive, as well as some detailed collection records, confirm that they live on the exposed sandy banks of mid- to large-size rivers or on sandy lake shores. Active on the surface mainly at night and hidden in the sand during the day, they can be driven to the surface by splashing water on the sand or by compressing the sand with one's feet (Jeannel 1949). If so disturbed, they can dig themselves back into the sand with surprising speed (Nietner 1857), aided no doubt by uniquely modified front tarsi and tibiae. Examination of gut contents has shown that they are general predators on other arthropods in their habitat, and numerous records of their collection at lights indicate that they can and do fly, at least at night. In their basic body form and coloration, in their habitat preferences and behavior, and also in their geographical range, they are very similar to members of the genus *Omophron* (tribe Omophronini), although the two groups are not closely related.

Recently, while obtaining material on loan from museums in North America and Europe in support of a study on the cyclosomines of an area in western Yunnan Province, China, I received a few specimens of *Cyclosomus* from the Afrotropical Region, mixed in with specimens from the

Oriental Region. This piqued my interest in learning more about the Afrotropical members of the genus, and I decided to solicit as much material from that region as possible for a taxonomic review. Individuals in charge of several collections (see below) generously made specimens in their care available on loan, including type specimens for virtually all the nominal species and subspecies names.

The history of taxonomic work on *Cyclosomus* in the Afrotropical region is mainly one of a few isolated descriptions of new species (Dejean 1831; Kolbe 1897; Fairmaire 1898; Jeannel 1949) or subspecies (Dupuis 1912; Kuntzen 1919), with minimal associated comparative information in most cases. Dupuis (1912) provided a detailed description of *Cyclosomus rousseaui* Dupuis and a key to African species of the genus, in which he distinguished four species, plus one additional subspecies. No synthetic study of the fauna has been published since then.

A study of the material accumulated through loans has permitted me to recognize six and perhaps seven species represented in the Afrotropical fauna, to recognize features of form and structure that distinguish them, to create a key for identification of their respective adults, and to summarize their known geographical distributions. To promote nomenclatural stability, lectotypes are designated where appropriate; two new synonymies are also proposed. No new species are described here.

MATERIALS AND METHODS

MATERIALS.—A total of 286 cyclosomine specimens from the Afrotropical Region were examined during this study, including the primary type specimens for all species names and their synonyms except for those of *Cyclosomus madecassus* Fairmaire. More than 200 additional specimens, including type specimens, other identified specimens and undetermined specimens from the Oriental Region, were also examined. Codens used throughout this report for collections from which specimens were borrowed and/or in which specimens, including primary types, are deposited are as follows:

- AMNH American Museum of Natural History, New York, New York, U.S.A.
- BMNH British Museum (Natural History), London, United Kingdom.
- CAS California Academy of Sciences, San Francisco, California, U.S.A.
- IRSNB Institut Royal des Sciences Naturelles de Belgique, Brussels, Belgium.
- MNHN Muséum National d'Histoire Naturelle, Paris, France.
- MRAC Musée Royal de l'Afrique Centrale, Tervuren, Belgium.
- NMNH U. S. National Museum of Natural History, Smithsonian Institution, Washington, DC, U.S.A.
- NHRS Naturhistoriska Riksmuseet, Stockholm, Sweden.
- ZMHB Museum für Naturkunde der Humboldt-Universität, Berlin, Germany.

EXAMINATION OF SPECIMENS.—Specimens were examined using a Leica MZ9.5 stereoscopic microscope with a Proline 80 LED Ring Illuminator.

MEASUREMENTS.—Several measurements (Fig. 1) were recorded for specimens examined: head length (LH), measured from the apex of the labrum to the occipital ridge of the head; pronotal length (LP), measured along midline from anterior margin to posterior margin (i.e., length of anterior angles not included in LP); pronotal width at widest point (WP); and elytral length (LE), measured from the basal groove of the scutellum (i.e., the point at which base of the pronotum contacts the scutellum, which is exposed in specimens where the forebody is bent downward relative to the elytra) to the apex of longer elytron. Body length (BL) was calculated as the sum of LH + LP + LE. The ratio of width to length of pronotum (WP/LP) was calculated based on those meas-

urements. All measurements were taken with the aid of the Leica MZ9.5 stereoscopic microscope fitted with ocular grid and calibrated scale reticules.

COLOR AND COLOR PATTERNS.—The predominant features used to describe and distinguish *Cyclosomus* species throughout the taxonomic history of this taxon have been those dealing with color and/or color pattern. To illustrate this point, I need only to cite Dupuis' (1912) key to the African *Cyclosomus*, which is the most comprehensive key for that fauna to date. With it, he distinguished four species and an additional subspecies on the basis of color (including presence or absence of metallic reflection) and color pattern only. The problem with such reliance on these features is that, in several if not all species, they are highly varied, both within and between populations, and undoubtedly subject to intense selection for concealment from predators in the open beach environment in which these beetles live. These color patterns and variations among them are very similar to those seen among *Omophron* species (Carabidae, tribe Omophronini), which share the same habitats.

Members of all species of *Cyclosomus* are basically pale (testaceous to a pale reddish brown) in ground color with variously developed contrasting dark patterns. Up to four dark elements, which appear to vary independently, are involved in the *Cyclosomus* color pattern, each of which may be dark and well developed, absent, or present at a state somewhere between these extremes. (1) The pronotum may be completely pale (Fig. 13–14) or have the disk darker, ranging from reddish brown (Fig. 11) to piceous (Fig. 4) or even black in different species, with variation in the tone even within populations and/or species. (2) The basal eighth of the elytra (from the midline to the lateral edge of interval 5), together with the length of interval 1, may be entirely pale (Fig. 13) or some darker tone (Figs. 6–12) up to and including black in some individuals. (3) The elytral middle transverse dark band may be present as a broad, continuous band extending from the midline to the lateral edge of interval 9 and extended anteriorly or posteriorly on that interval (Fig. 11) or variously narrowed, laterally limited, discontinuous (Figs. 1–3, 6–14) or even completely absent (Fig. 4). Again, at least some variation in the development of this band or its fragmented homologs is found both within and between populations of most of the species. (4) A subapical dark spot may also be present and well developed (Fig. 11) on each elytron, smaller or less distinctly developed (Figs. 1, 9, 10 and 13) or absent (Figs. 2–8, 12 and 14). Of course all of these dark areas may be indistinct or even invisible in newly-emerged adults that are still teneral and have not yet developed their full pigmentation pattern. Such individuals are difficult if not impossible to properly identify with color characters alone. Another feature that is useful in distinguishing members of some species, metallic reflection, requires presence of a dark background to be seen distinctly. Consequently, teneral specimens may not exhibit metallic reflection that would be visible if they were fully pigmented. All the above comments are provided as a caution against reliance on the most obvious features of the beetles, their colors and color patterns, in attempts to identify them.

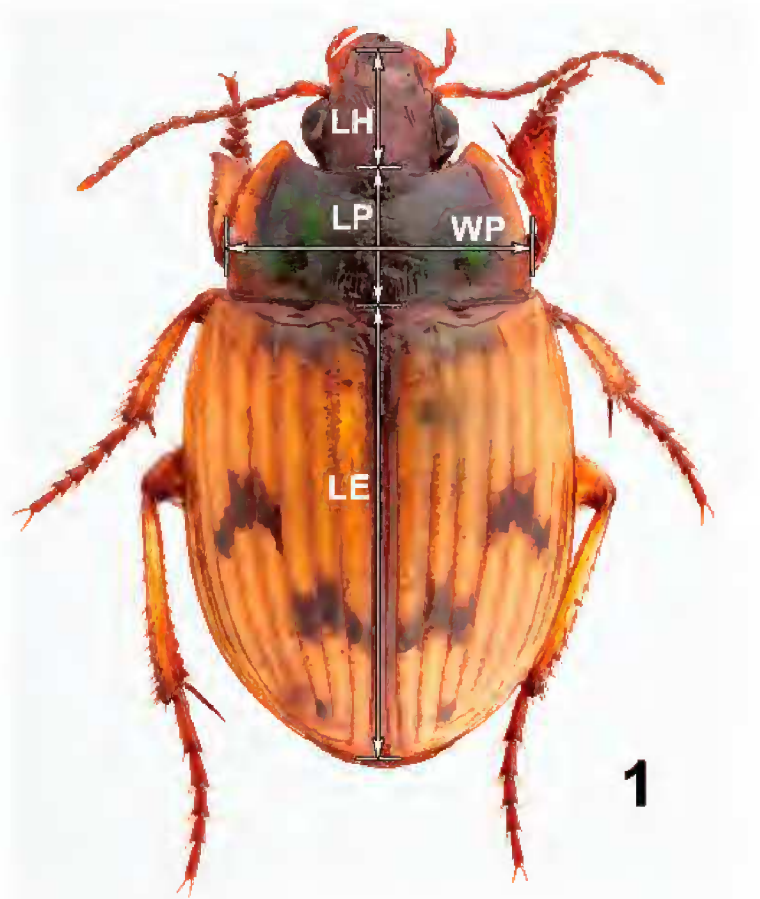


FIGURE 1. Digital photograph showing locations and limits of measurements; LE = length of elytra, LH = length of head, LP = length of pronotum, WP = width of pronotum.

ILLUSTRATIONS.— Digital images of whole specimens and particular structures were taken using a Visionary Digital BK Lab System with a Canon EOS 5D Mark II digital camera.

DISTRIBUTIONAL DATA.— Because locality names and geopolitical units throughout Africa have changed so dramatically and repeatedly over the last few centuries, type localities are cited using the current country, regional and locality names for them, not necessarily as in the original citations. Locality records for other specimens have also been converted to their current names where this could be done unambiguously. Maps illustrating the distributions of localities for specimens examined were modified from the “Whole world – land and oceans 12000.jpg” map available from Wikipedia Commons online at <http://en.wikipedia.org/wiki/File:Whole_world_land_and_oceans_12000.jpg>

TAXONOMY

Tribe Cyclosomini LaPorte de Castelnau, 1834

Genus *Cyclosomus* Latreille

Scolytus Fabricius, 1790:221, in part [junior homonym of *Scolytus* Geoffroy, 1762] (type species *Carabus limbatus* Fabricius, 1801, designated by Latreille (1810:426). Fabricius (1792:180); Bousquet (2012:89). *Cyclosomus* Latreille, 1829:394 (type species *Carabus flexuosus* Fabricius, 1775, by monotypy).

Key for Identification of Adults of *Cyclosomus* species of the Afrotropical Region

Both male and female adults of *Cyclosomus* species from the Afrotropical Region can be identified using the key below. I have tried to avoid gender-specific features as much as possible in creating the key, and where features unique to males are used, they are presented only as secondary in importance. However, these features can be very helpful in confirming the identification of males. Male specimens of all species included in the key have small pads of adhesive setae on the ventral surfaces of front tarsomeres 1 to 3. Females have no such pads. Although in most carabid beetle species these front tarsomeres are also distinctly broader in males than in females, in the Afrotropical *Cyclosomus* species these differences are very slight and therefore difficult to assess. Contributing to this difficulty is the fact that both males and females have the basal three tarsomeres asymmetrically expanded laterally as flat plates that undoubtedly aid in digging into the sandy substrate they inhabit. I also recommend that users of the key review the cautions given in the section entitled “Color and color patterns” under Materials and Methods above.

- 1a. Elytra (Figs. 2a, 3) distinctly broader basally than base of pronotum, with humeri slightly projected anteriorly and broadly rounded, not angulate; pronotum (Fig. 15) with three to six lateral setae anterior to middle on each side, anterior angles narrow, sharply pointed, lateral margins distinctly sinuate subapically *Cyclosomus basalis* Kolbe
- 1b. Elytra (Figs. 1, 4–14) not or only slightly broader at base than base of pronotum, with humeri sharply angulate; pronotum (Figs. 15–23) with one lateral setae at or anterior to middle on each side (very few specimens with a second such seta unilaterally), anterior angles broadly rounded to sharply pointed, lateral margins not or only faintly sinuate subapically 2
- 2a. Elytral color pattern as in Fig. 11, with middle dark transverse band broad and complete across elytra, confluent with dark interval 1, and expanded across middle half of interval 9, subapical dark spot distinct on intervals 4 and 5; prosternal intercoxal process (Fig. 28) long *Cyclosomus flexuosus* (Fabricius)
- 2b. Elytral color pattern (Figs. 1–3, 4–10, 12–14) not as above, middle dark transverse band absent or interrupted, not extended to or expanded on interval 9, subapical dark spot absent, present

- only on interval 4, or present on intervals 4 to 6; prosternal intercoxal process (Figs. 24–26, 29–30) short to long. 3
- 3a. Pronotum (Figs. 17–18) with two or more setae inserted on anterior margin at and medial to anterior angles, anterior angles broadly or moderately rounded; size large (body length 9.0 to 10.7 mm); dorsum without metallic reflection; forebody dark reddish-brown, broadly and slightly paler laterally, elytral middle transverse band piceous or black; male with middle tarsomeres 1 to 3 laterally expanded and with ventral pads of adhesive setae (Fig. 32)
 *Cyclosomus collarti* Burgeon
- 3b. Pronotum (Figs. 16, 19–20, 22–23) without setae on anterior margin, anterior angles more narrowly rounded to pointed; size smaller (body length varied, 6.3 to 10.3 mm); forebody color varied from piceous to pale reddish-brown, width of lateral pronotal pale areas and elytral color pattern also varied; male with middle tarsomeres 1 to 3 not laterally expanded and without pads of adhesive setae on ventral surfaces (Fig. 31). 4
- 4a. Pronotum pale yellow-tan to reddish brown, broadly and only slightly paler laterally, without metallic reflection; elytral color pattern (Figs. 13–14) with interval 1 not or only slightly darker than pale sections of other intervals, lateral portion of interrupted middle transverse band present on full width of interval 8 *Cyclosomus rousseaui* Dupuis
- 4b. Pronotum dark reddish-brown or piceous, with contrasting paler areas laterally, dark areas with distinct to faint metallic green (bronze in a few specimens) reflection; elytral color pattern varied (Figs. 4–5, 10, 12), with interval 1 distinctly darker (dark brown to black) than pale sections of other intervals, lateral portion of interrupted middle transverse band not present on interval 8 or present only on the medial edge of interval 8. 5
- 5a. Pronotum (Figs. 19–20) with lateral pale band narrow anteriorly, widened basally, anterior angles narrow, sharply pointed or narrowly rounded apically; pronotum relatively narrow, ratio WP/WPB less than 2.25 (mean = 2.15, n = 59); male with median lobe of aedeagus with shaft thick and abruptly tapered subapically, ventral margin of shaft slightly recurved subapically (Fig. 36), slightly deflected right at apical third in dorsal view (Fig. 43); apical lamella short, with sides evenly convergent to broadly rounded apex (Fig. 43)
 *Cyclosomus equestris* Boheman
- 5b. Pronotum (Figs. 16, 22) with lateral pale band broad anteriorly and distinctly widened basally, anterior angles broader, narrowly to broadly rounded apically; pronotum relatively broader, ratio WP/WPB greater than 2.30; male genitalia with different form. 6
- 6a. Prosternal intercoxal process (Fig. 25) long; body length 7.8 mm or less; dark areas on pronotum and elytra with vivid metallic green reflection; male with median lobe of aedeagus with shaft broadly tapered apically, ventral margin of shaft straight or nearly so in apical third (Fig. 34), distinctly offset right at apical third in dorsal view (Fig. 41); apical lamella very short, with sides evenly convergent to broadly rounded apex (Fig. 41); specimens from mainland Africa *Cyclosomus buquetii* Dejean
- 6b. Prosternal intercoxal process (Fig. 29) short; body length more than 8.0 mm; dark areas on pronotum and elytra with faint metallic green reflection; male with median lobe of aedeagus with shaft thick and abruptly tapered subapically, ventral margin of shaft nearly straight in apical half (Fig. 38), very slightly offset right at apical third in dorsal view (Fig. 45); apical lamella short, slightly deflected ventrally (Fig. 38), with sides evenly convergent to broadly and roundly pointed apex (Fig. 45); specimen from Madagascar
 *Cyclosomus madecassus* Fairmaire

Cyclosomus basalis Kolbe

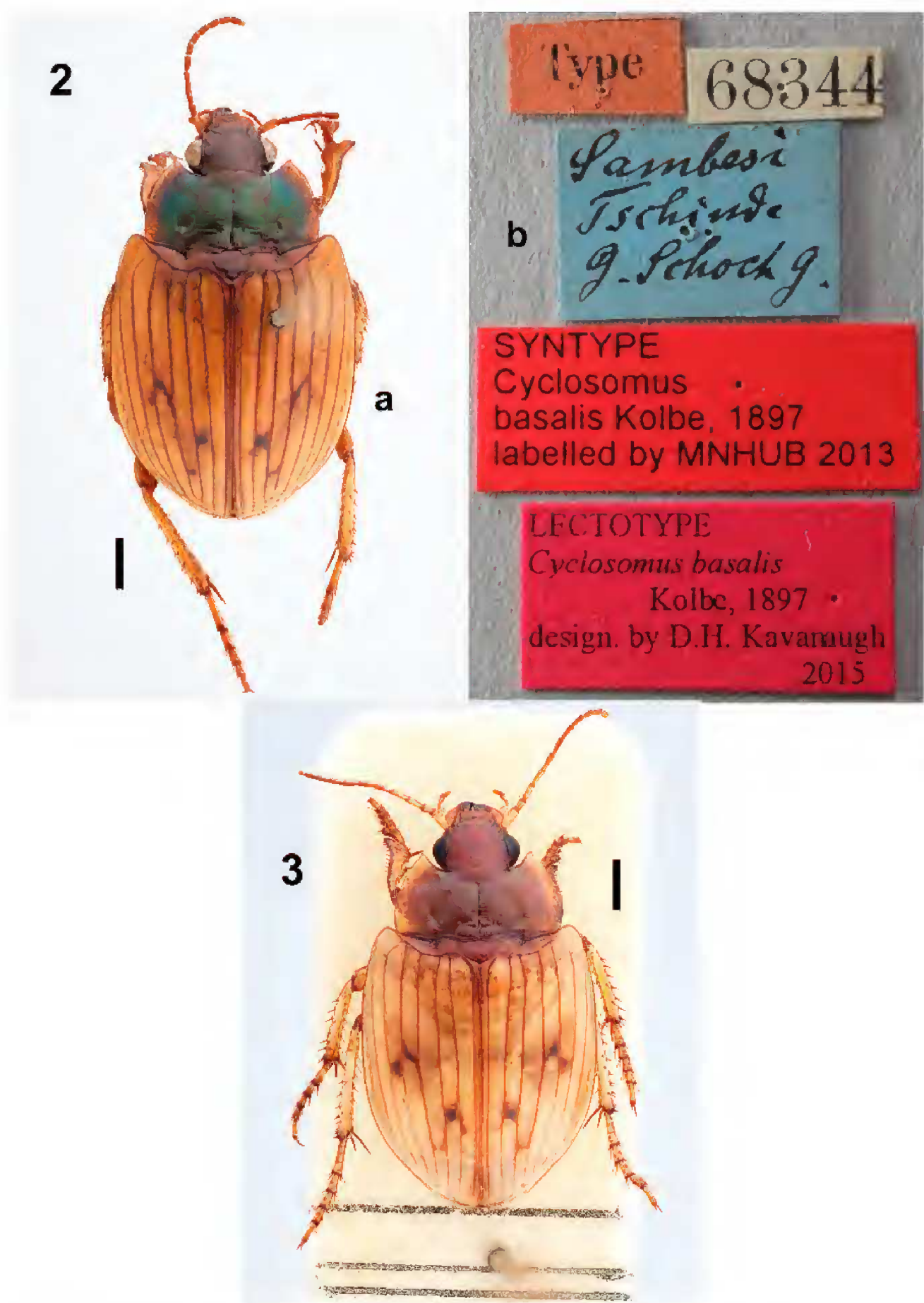
Cyclosomus basalis Kolbe, 1897:349. LECTOTYPE (Fig. 2), here designated, a female, in ZMHB, labeled: "Type" [faded red label]/ "68344"/ "Sambesi Tschinde, G. Schoch G." [handwritten blue label]/ "Syntype *Cyclosomus basalis* Kolbe, 1897 labelled by MNHUB 2013" [red label]/ "LECTOTYPE *Cyclosomus basalis* Kolbe, 1897, design. by D.H. Kavanaugh 2015" [red label]. Type locality: Mozambique, Zambezia Province, Chinde. Dupuis (1912:284); Csiki (1932:1294); Lorenz (2005:452).

DIAGNOSIS.—Adults of *C. basalis* can be distinguished from those of other *Cyclosomus* species in the Afrotropical Region by the following combination of character states: Habitus as in Figs. 2a and 3. Size moderate for genus, BL = 9.2–9.6 mm. Head dark brown to piceous or pale reddish-brown; pronotum dark brown to piceous or reddish-brown, with lateral pale areas narrow, only slightly broader basally; elytra mainly pale yellow-tan, darker color pattern (Figs. 2a, 3) with area anterior to basal margin and interval 1 light reddish brown, middle transverse dark band reddish-brown to piceous, W-shaped, extended laterally only to interval 5 or 6, very thin or discontinuous, subapical dark spot absent; dark areas of pronotum with distinct to faint metallic green reflection, dark areas of elytra without metallic reflection. Pronotum (Fig. 15) with anterior angles narrow, sharply pointed, lateral margins distinctly sinuate subapically, with three to six lateral setae anterior to middle on each side, without setae on anterior margin. Prosternal intercoxal process (Fig. 24) medium-length. Elytra (Figs. 2a, 3) distinctly broader basally than base of pronotum, with humeri slightly projected anteriorly and broadly rounded, not angulate. Male with middle tarsomeres 1 to 3 not laterally expanded and without ventral pads of adhesive setae (see Fig. 31). Male with median lobe of aedeagus as in Figs. 33 and 40, with shaft gradually tapered apically and ventral margin smoothly arcuate (Fig. 33); apical lamella short and broadly rounded apically (Fig. 40).

Adults of *C. basalis* are easily distinguished from members of all other *Cyclosomus* species by their broadly rounded elytral humeri and pronotum much narrower basally than the base of the elytra. They are also unique in having three or more lateral setae in the apical half along the pronotal margin. Members of all other species have a single seta on each side at or anterior to the middle of the pronotum [although a very few specimens have a second anterolateral seta unilaterally]. Specimens examined from Mozambique have darker heads and pronota than those from Tanzania and Malawi. It will be interesting to see if this apparent pattern of geographical variation is confirmed by additional specimens collected in the future from these areas or from areas between them.

GEOGRAPHICAL DISTRIBUTION.—(Fig. 47.) At present, known only from a narrow zone in East Africa, extending from central Tanzania, through Malawi, and south to the Zambezi River Delta in Mozambique. I examined a total of 5 specimens (1 male and 4 females) from the following localities: **Malawi:** Northern Region (5 km S of Chintche on shore of Lake Malawi [ZMHB]). **Mozambique:** Sofala Province (Caia [BMNH]); Zambesia Province (Chinde [ZMHB]). **Tanzania:** Iringa Region (50–70 km W of Iringa [ZMHB]). **Other records:** "E. Africa" ([BMNH]).

HABITAT DISTRIBUTION.—Label data associated with the specimen from Lake Malawi (see above) indicate that it was collected on the sandy shore of the lake. These beetles probably occur on the open, sandy banks of lakes and rivers within their range in eastern Africa. They are best collected at night when they are active on the dry sand surface of river banks or at lights in the vicinity of such riparian or lacustrine habitats.



FIGURES 2–3. *Cyclosomus basalis* Kolbe. Fig. 2. Lectotype female; a, digital photograph of dorsal habitus; b, specimen labels. Fig. 3. Digital photograph of male, dorsal habitus (5 km S of Chintheche on shore of Lake Malawi, Northern Region, Malawi). Scale lines = 1.0 mm.

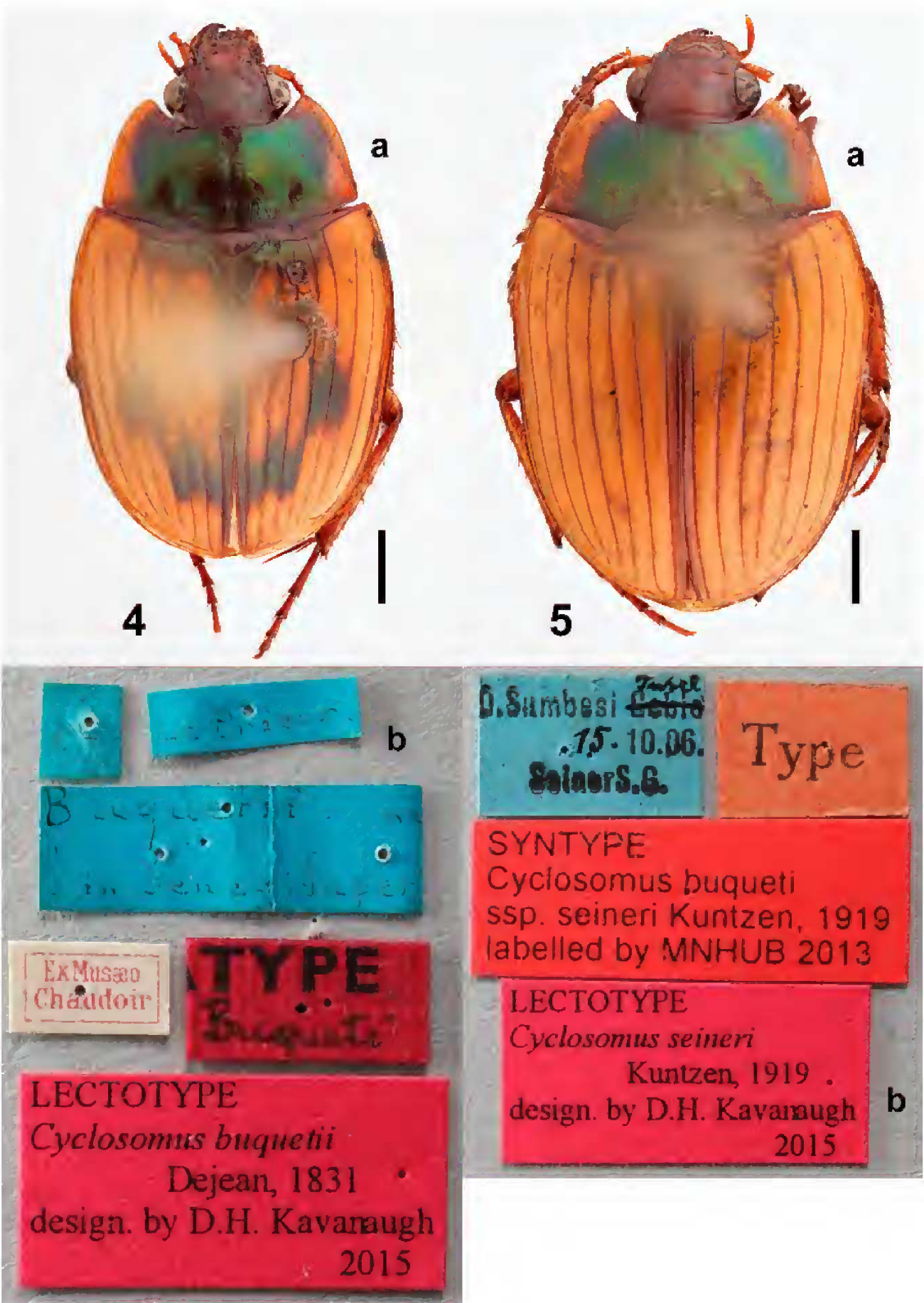
Cyclosomus buquetii Dejean

- Cyclosomus buquetii* Dejean, 1831:812. LECTOTYPE (Fig. 4), here designated, a female, in MNHN, labeled: "C[?, pin hole through a second, illegible, letter]" [handwritten on small blue square]/ "Buquetii sp. n., Seneg. Super" [handwritten on blue label]/ "LePrieur." [handwritten on blue label]/ "Ex Musaeo Chaudoir" [red lettering on white label]/ "TYPE Buqueti" [red label]/ "LECTOTYPE *Cyclosomus buquetii* Dejean, 1831, design. by D.H. Kavanaugh 2015" [red label]. Type locality: northern Senegal. Lorenz (2005:452).
- Cyclosomus buqueti seineri* Kuntzen. 1919:121. LECTOTYPE (Fig. 5), here designated, a male, in ZMHB, labeled: "D. Sambesi Insel 15.10.06. Seiner S.G." [blue label with "Insel" handwritten]/ "TYPE" [faded red label]/ "SYNTYPE *Cyclosomus buqueti* ssp. *seineri* Kuntzen, 1919 labelled by MNHUB 2013" [red label]/ "LECTOTYPE *Cyclosomus seineri* Kuntzen, 1919, design. by D.H. Kavanaugh 2015" [red label]. Paralectotypes examined: 1 female, also in ZMHB, labeled as lectotype except last label replaced with "PARALECTOTYPE *Cyclosomus seineri* Kuntzen, 1919, design. by D.H. Kavanaugh 2015" [yellow label]; and 1 female, also in ZMHB, labeled: "D. Sambesi Gebt. ~~10.06.~~ F. Seiner S.G." [blue label]/ "TYPE" [faded red label]/ "C. buqueti sbsp. *seineri* m.[plus one additional illegible word]" [handwritten label]/ "SYNTYPE *Cyclosomus buqueti* ssp. *seineri* Kuntzen, 1919 labelled by MNHUB 2013" [red label]/ "PARALECTOTYPE *Cyclosomus seineri* Kuntzen, 1919, design. by D.H. Kavanaugh 2015" [yellow label]. Type locality: Namibia, Caprivi Strip, Impalila. Csiki (1932:1295).
- Cyclosomus buqueti* Dejean. Chaudoir (1876:32); Boheman (1848:189); Kolbe (1897:350); Dupuis (1912:284); Kuntzen (1919:121); Burgeon (1931:309); Csiki (1932:1295); Jeannel (1949:876).
- Cyclosomus equestris*, Chaudoir (1876:32); Dupuis (1912:284), as a synonym.
- Cyclosomus buquetii seineri* Kuntzen. Lorenz (2005:452).

NOTES ON TYPES AND NOMENCLATURE.— The name *C. buquetii seineri* was proposed for specimens with the elytral middle transverse dark band absent or represented only by a small dark spot at the apical one-fourth on interval 4. This form (Fig. 5) has been found virtually throughout the range of this species, together at several localities with specimens having more extensively developed middle transverse dark bands (Fig. 4), so maintaining this name as a subspecific epithet seems unjustified.

DIAGNOSIS.— Adults of *C. buquetii* can be distinguished from those of other *Cyclosomus* species in the Afrotropical Region by the following combination of character states: Habitus as in Figs. 4–5. Size small for genus, BL = 6.3–7.8 mm. Head reddish-brown to piceous; pronotum dark brown to piceous with lateral pale areas broad anteriorly and further broadened basally; elytra mainly pale yellow-tan, darker color pattern (Figs. 4–5) with medial basal area and interval 1 light reddish-brown to piceous, middle transverse dark band absent or reddish-brown to piceous, W-shaped, extended laterally only to interval 5 or 6, very thin or discontinuous, subapical dark spot absent; dark area of pronotum with distinct metallic green or bronze reflection. Pronotum (Fig. 16) relatively broad, ratio WPB/LP = 2.28–2.88 (mean = 2.38; n = 34), anterior angles moderately to narrowly rounded or bluntly pointed, lateral margins evenly rounded, not sinuate subapically, with one lateral seta at or anterior to middle on each side (very few specimens with a second such seta unilaterally), without setae on anterior margin. Prosternal intercoxal process (Fig. 25) long. Elytra (Figs. 4–5) not or only slightly broader at base than base of pronotum, with humeri sharply angulate. Male with middle tarsomeres 1 to 3 not laterally expanded and without ventral pads of adhesive setae (see Fig. 31). Male with median lobe of aedeagus as in Figs. 34 and 41, with shaft broadly tapered apically, its ventral margin straight or nearly so in apical third (Fig. 34), distinctly offset right at apical third in dorsal view (Fig. 41); apical lamella very short, with sides evenly convergent to broadly rounded apex (Fig. 41).

Adults of *C. buquetii* are most similar in habitus to those of *C. equestris* and *C. madecassus*.



FIGURES 4–5. Type specimens of *Cyclosomus* species; a, digital photograph of dorsal habitus; b, specimen labels. Fig. 4. *C. buquetii* Dejean, lectotype female. Fig. 5. *C. seineri* Kuntzen, lectotype male.

However, they are typically smaller in size (although the smallest adults of *C. equestris* are within the size range of *C. buquetii*) and have a distinctly longer prosternal intercoxal process than members of either species. They also differ from *C. equestris* members in having a relatively broader pronotum with more broadly rounded anterior angles and a lateral pronotal pale band that is distinctly broader anteriorly. From members of *C. madecassus*, they also differ in having more vividly metallic reflection on dark areas of the pronotum and elytra. Males of these three species are also easily distinguished by the form of the median lobe of their genitalia.

GEOGRAPHICAL DISTRIBUTION.—(Fig. 48.) Widespread across Sub-Saharan Africa, from Senegal to Sudan and Somalia, south to South Africa. I examined a total of 37 specimens (9 males and 28 females) from the following localities: **Burundi:** Bujumbura Rural Province (Rusizi River Delta [ZMHB]). **Cameroon:** (no locality [ZMHB]). **Democratic Republic of the Congo:** Bas Congo Province (Banana [IRSNB]); Kasai Oriental (Sankuru “Beni Bendi” [ZMHB]); Katanga Province (Kalemie [IRSNB]). **Malawi:** Northern Region (5 km S of Chintheche on shore of Lake Malawi [ZMHB]). **Mozambique:** Cabo Delgado Province (Porto Amelia [BMNH]); Manica Province (Amatongas [BMNH]); Sofala Province (Beira [BMNH]). **Namibia:** Caprivi Strip (Impalila [ZMHB]). **Senegal:** northern part ([MNH]). **Somalia:** Awdal Province (Borama [NHRS]). **South Africa:** KwaZulu-Natal Province (Durban [BMNH]; Ithala Game Reserve [ZMHB]). **Sudan:** Khartoum State (Bahr-el-Abiad [NHRS]); West Darfur State (El Geneina [ZMHB]). **Tanzania:** Mbeya Region (Tukuyu [ZMHB]). **Other records:** “E. Africa” ([BMNH]); “Cape” ([BMNH]); “O. Sambesi Gebt.” ([ZMHB]); “Wahrsih.: Sambesi” ([ZMHB]).

HABITAT DISTRIBUTION.—Label data associated with the specimens from of Lake Malawi (see above) indicate that they were collected on the sandy shore of the lake. These beetles probably occur on the open, sandy banks of lakes and rivers throughout Sub-Saharan Africa. They are best collected at night when they are active on the dry sand surface of river banks or at lights in the vicinity of such riparian or lacustrine habitats.

Cyclosomus collarti Burgeon

Cyclosomus collarti Burgeon, 1931:307. HOLOTYPE (Fig. 6), a male, in MRAC, labeled: “MUSÉE DU CONGO, Ituri: Forêt de Kawa, 20-4-1929 (A. Collart)” [mostly handwritten]/ “Cyclosomus Collarti Type n. sp.” [handwritten]/ “HOLOTYPE *Cyclosomus collarti* Burgeon, 1931” [red label] Paratypes examined: 1 female, in IRSNB, labeled: “Ituri: Forêt de Kawa, 20-4-1929 (A. Collart)” [mostly handwritten]/ “Cyclosomus collarti Burg. Paratype” [handwritten]; 3 males and 1 female, in MRAC, labeled: “PARATYPE” [orange label]/ “MUSÉE DU CONGO, Ituri: Forêt de Kawa, 20-4-1929 (A. Collart)” [mostly handwritten]; 1 female, in MNHN labeled: “PARATYPE” [orange label]/ “MUSÉE DU CONGO, Ituri: Forêt de Kawa, 20-4-1929 (A. Collart)” [mostly handwritten]/ “Museum Paris, Coll. Ch. Alluaud” [pale blue label]/ “Cyclosomus collarti Déterm. L. Burgeon” [partly handwritten]; 5 males and 5 females, in MRAC, labeled: “PARATYPE” [orange label]/ “MUSÉE DU CONGO, Ituri: Forêt de Kawa, 30-4-1929 (A. Collart)” [partly handwritten]/ “Forêt de Kawa 30-IV-29 A. Collart” [partly handwritten]; 1 males and 2 females, in MRAC labeled: “PARATYPE” [orange label]/ “MUSÉE DU CONGO, Lac Albert: Forêt de Kawa, 30-4-1929 (A. Collart)” [partly handwritten]/ “Forêt de Kawa 30-IV-29 A. Collart” [partly handwritten]; 5 males and 1 female, in IRSNB, labeled: “Forêt de Kawa, (Lac Albert) 10-IV-29 A. Collart” / “L. Burgeon det. 1930, CYCLOSOMUS collarti Burg.”/ “Para-type” [orange label]/ “cf. Rev. Zool. Bot. afr., 20, pp. 307–308”/ “P. Basilewsky vid., 1947, CYCLOSOMUS Collarti Burg.”; 2 males and 2 females, in MRAC, labeled: “PARATYPE” [orange label]/ “Forêt de Kawa, (Lac Albert) 10-IV-29 A. Collart” / “COL. MUS, CONGO, Col. P. Basilewsky”; 2 males, in MRAC, labeled: “PARATYPE” [orange label]/ “FORÊT DE KAWA, LAC ALBERT, A. COLLART” / “COL. MUS, CONGO, Col. P. Basilewsky”; 5 males and 2 females, in IRSNB, labeled: “Forêt de Kawa 19-IV-29 A. Collart” [partly handwritten]/ “L. Burgeon det. 1930, CYCLOSOMUS collarti Burg.”/ “Para-type” [orange label]/ “cf. Rev. Zool. Bot. afr.,

20, pp. 307–308”/ “P. Basilewsky vid., 1947, *CYCLOSOMUS* Collarti Burg.”; 3 males and 4 females, in IRSNB, labeled: “Forêt de Kawa 20-IV-29 A. Collart” [partly handwritten]/ “L. Burgeon det. 1930, *CYCLOSOMUS* collarti Burg.”/ “Para-type” [orange label]/ “cf. Rev. Zool. Bot. afr., 20, pp. 307–308”/ “P. Basilewsky vid., 1947, *CYCLOSOMUS* Collarti Burg.”; 4 males and 5 females, in IRSNB, labeled: “Forêt de Kawa 30-IV-29 A. Collart” [partly handwritten]/ “L. Burgeon det. 1930, *CYCLOSOMUS* collarti Burg.”/ “Para-type” [orange label]/ “cf. Rev. Zool. Bot. afr., 20, pp. 307–308”/ “P. Basilewsky vid., 1947, *CYCLOSOMUS* Collarti Burg.”. Type locality: Democratic Republic of the Congo, Orientale Province, shore of Lake Albert. Alluaud (1935:11); Lorenz (2005:452).

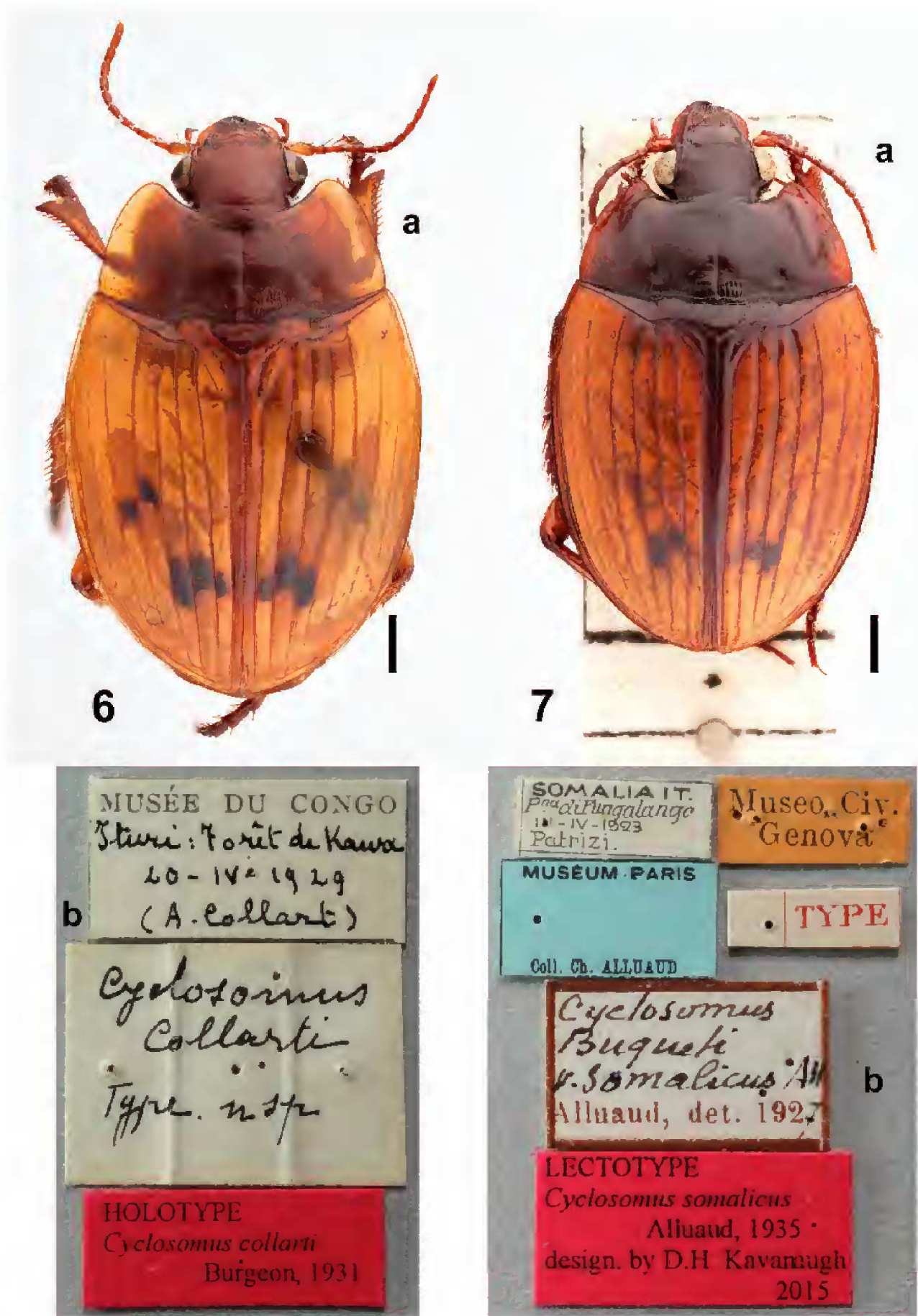
Cyclosomus buqueti somalicus Alluaud, 1935:11. LECTOTYPE (Fig. 7), here designated, a female, in MNHN, labeled: “SOMALIA IT., P^{na}. di Fungalango, III-IV 1923, Patrizi”/ “Museo Civ. Genova” [orange label, facing downward]/ “Museum Paris, Coll. Ch. Alluaud” [pale blue label]/ “TYPE” [red ink on white label]/ “*Cyclosomus buqueti* v. *somalicus* Alluaud All., Alluaud, det. 1927”/ “LECTOTYPE *Cyclosomus somalicus* Alluaud, 1935, design. by D.H. Kavanaugh 2015” [red label]. Type locality: Somalia, Jubba River at Fungalango. **NEW SYNONYMY.**

NOTES ON TYPES AND NOMENCLATURE.— Although Alluaud described *C. somalicus* as a subspecies of *C. buquetii*, the presence of setae laterally on the anterior margin of the pronotum of the type is a feature unique to *C. collarti* members among all *Cyclosomus* species. Other features of the lectotype of *C. somalicus* are all within the known range of variation seen among *C. collarti* specimens.

DIAGNOSIS.— Adults of *C. collarti* can be distinguished from those of other *Cyclosomus* species in the Afrotropical Region by the following combination of character states: Habitus as in Figs. 6–7. Size moderate to large for genus, BL = 9.0–10.7 mm. Head reddish-brown to dark brown; pronotum reddish-brown to dark brown with lateral pale areas broad and broadened basally; elytra mainly pale yellow-tan, darker color pattern (Figs. 6–7) with area anterior to basal margin (also medial area just posterior to basal margin in some specimens) and interval 1 light reddish brown, middle transverse dark band reddish-brown to piceous, W-shaped, extended laterally only to interval 5 or 6, thick to very thin or discontinuous, subapical dark spot absent; dorsum without metallic reflection. Pronotum (Figs. 17–18) with anterior angles broadly rounded, lateral margins evenly rounded, not sinuate subapically, with one lateral seta at or anterior to middle on each side (very few specimens with a second such seta unilaterally) and with two or more setae inserted on anterior margin at and medial to anterior angles. Prosternal intercoxal process (Fig. 26) very short. Elytra (Figs. 6–7) not or only slightly broader at base than base of pronotum, with humeri sharply angulate. Male with middle tarsomeres 1 to 3 laterally expanded and with ventral pads of adhesive setae (Fig. 32). Male with median lobe of aedeagus as in Figs. 35 and 42, with shaft gradually tapered apically, its ventral margin smoothly arcuate (Fig. 33), slightly offset right at apical third in dorsal view (Fig. 42); apical lamella long, slightly recurved dorsally at apex (Fig. 35), parallel-sided and broadly rounded apically (Fig. 42).

Adults of *C. collarti* can be distinguished from those of all other *Cyclosomus* species by the presence of a fringe of two or more setae on the anterior margin of the pronotum on each side at and/or just medial to the apex of the apical angles. Males of this species are also unique in having the three basal tarsomeres of the middle tarsi laterally expanded and with large pads of adhesive setae ventrally.

GEOGRAPHICAL DISTRIBUTION.— (Fig. 49.) Widespread across Sub-Saharan Africa north of the Equator, from Nigeria to Sudan, Ethiopia and Somalia, and south to Cameroon and northern Democratic Republic of the Congo. I examined a total of 168 specimens (75 males and 93 females) from the following localities: **Cameroon:** Central Region (Loko [ZMHB]); North Region (Garoua [ZMHB]). **Democratic Republic of the Congo:** Ituri Province (Lac Albert at Kawa Forest [CAS;



Figures 6–7. Type specimens of *Cyclosomus* species; a, digital photograph of dorsal habitus; b, specimen labels. Fig. 6. *C. collarti* Burgeon, holotype male. Fig. 7. *C. somalicus* Alluaud, lectotype female. Scale lines = 1.0 mm.

IRNSB; MRAC, MNHN)). **Ethiopia:** Gambela Province (Gambela [MRAC]; 2 km N of Gambela [MRAC]). **Nigeria:** Kaduna State (Samaru [BMNH]); Kogi State (Amageda [ZMHB]; Lokoja [BMNH]). **Somalia:** Lower Juba Region (Jubba River at Fungalango [MNHN]). **Sudan:** Khartoum State (Bahr-el-Abiad [NHRS]); North Darfur State (Kutum [ZMHB]); River Nile State (Shendi [BMNH]); West Darfur State (El Geneina [ZMHB]). **Other records:** “Blue Nile” ([BMNH]); “Kamerun, [plus more illegible text]” [handwritten] ([ZMHB]).

HABITAT DISTRIBUTION.— According to Burgeon (1931), specimens of the type series were collected on the shore of Lake Albert. Label data associated with specimens from localities in Ethiopia (Gambela), Nigeria (Samaru), and Sudan (El Geneina and Shendi) indicate that they were collected at white or mercury vapor lights at night, so members of this species apparently are excellent fliers. These beetles probably occur on the open, sandy banks of lakes and rivers throughout the Sub-Saharan region described above. They are best collected at night when they are active on the dry sand surface of river banks or at lights in the vicinity of such riparian or lacustrine habitats.

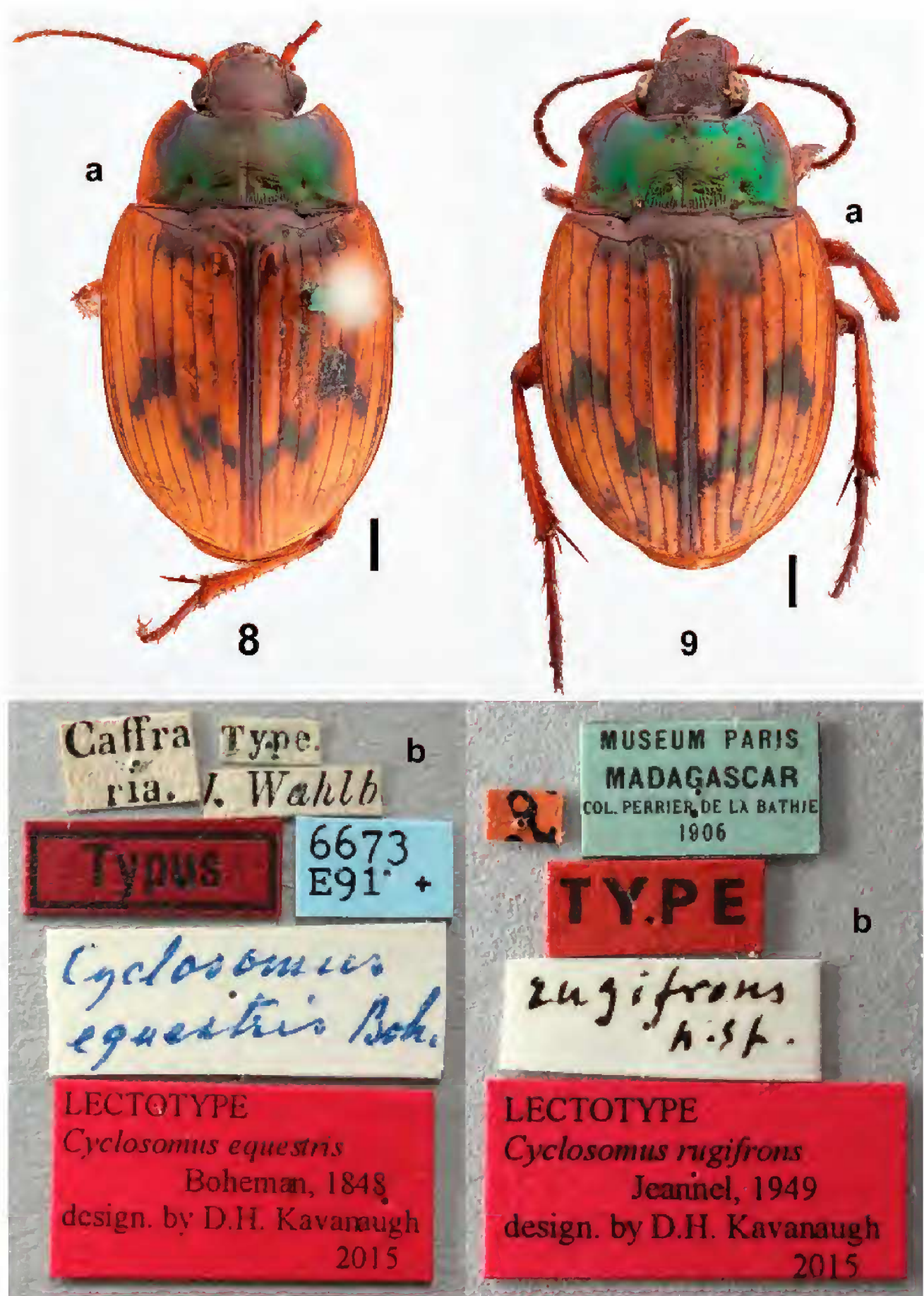
Cyclosomus equestris Boheman

Cyclosomus equestris Boheman, 1848:189. LECTOTYPE (Fig. 8), here designated, a male, in NHRS, labeled: “Caffraria.”/ “J. Wahlb”/ “Typus” [red label]/ “6673 E91” [pale blue label]/ “Cyclosomus equestris Boh.” [handwritten]/ “LECTOTYPE *Cyclosomus equestris* Boheman, 1848, design. by D.H. Kavanaugh 2015” [red label]. Type locality: South Africa, Eastern Cape Province. Fairmaire (1989:222); Kolbe (1987:350); Kuntzen (1919:121); Burgeon (1931:309); Lorenz (2005:452).

Cyclosomus rugifrons Jeannel, 1949:876. LECTOTYPE (Fig. 9), here designated, a male, in MNHN, labeled: [small red square with male symbol]/ “MUSEUM PARIS, MADAGASCAR, COL. PERRIER DE LA BATHIE, 1906,” [pale blue-green label]/ “TYPE” [red label]/ “rugifrons n.sp.” [handwritten]/ “LECTOTYPE *Cyclosomus rugifrons* Jeannel, 1949, design. by D.H. Kavanaugh 2015” [red label]. Type locality: Madagascar, Mahajanga Province, Maevatanana. Lorenz (2005:452). **NEW SYNONYMY.**

NOTES ON TYPES AND NOMENCLATURE.— In his treatment of the Malagasy species of *Cyclosomus*, Jeannel (1949) compared *C. madecassus* with *C. flexuosus* and *C. buquetii*, but not with *C. equestris*, and *C. rugifrons* only with *C. madecassus*. It is possible that *C. equestris* was unknown to him. The lectotype of *C. rugifrons* is indistinguishable in features of external form and structure and form of the median lobe of male genitalia from specimens of *C. equestris*, which is why I consider *C. equestris* and *C. rugifrons* as synonymys.

DIAGNOSIS.— Adults of *C. equestris* can be distinguished from those of other *Cyclosomus* species in the Afrotropical Region by the following combination of character states: Habitus as in Figs. 8–10. Size exceptionally varied for genus, BL = 7.0–10.3 mm. Head dark reddish-brown to piceous; pronotum reddish-brown to piceous with lateral pale areas narrow anteriorly and broadened basally; elytra mainly pale yellow-tan, darker color pattern (Figs. 8–10) with medial basal area and interval 1 light reddish-brown to piceous, middle transverse dark band absent or reddish-brown to piceous, W-shaped, extended laterally only to interval 6 or 7, thick to very thin or discontinuous, subapical dark spot present or absent; dark area of pronotum with distinct metallic green or bronze reflection, dark areas of elytra without or with only faint metallic green or bronze reflection. Pronotum (Figs. 19–20) relatively narrow, ratio WPB/LP = 2.02–2.23 (mean = 2.15; n = 59), anterior angles moderately rounded to sharply pointed, lateral margins not or only faintly sinuate subapically and moderately (Fig. 19) to very slightly (Fig. 20) arcuate, with one lateral setae at or anterior to middle on each side (very few specimens with a second such seta unilaterally), without setae on anterior margin. Prosternal intercoxal process (Fig. 27) medium-length. Elytra (Figs. 8–10) not or only slightly broader at base than base of pronotum, with humeri sharply angulate.



Figures 8–9. Type specimens of *Cyclosomus* species; a, digital photograph of dorsal habitus; b, specimen labels. Fig. 8. *C. equestris* Boheman, lectotype male. Fig. 9. *C. somalicus* Alluaud, lectotype male. Scale lines = 1.0 mm.

Male with middle tarsomeres 1 to 3 not laterally expanded and without ventral pads of adhesive setae (see Fig. 31). Male with median lobe of aedeagus as in Figs. 36 and 43, with shaft thick and abruptly tapered subapically, its ventral margin slightly recurved subapically (Fig. 36), slightly deflected right at apical third in dorsal view (Fig. 43); apical lamella short, with sides evenly convergent to broadly rounded apex (Fig. 43).

Adults of *C. equestris* are most similar in habitus to those of *C. buquetii* and *C. madecassus*. They have a narrower pronotum with narrower, less rounded or pointed anterior angles and a lateral pronotal pale band that is distinctly narrower anteriorly than members of either of the other species. They differ from members of *C. buquetii* also in having a shorter prosternal intercoxal process. From members of *C. madecassus*, they also differ in having more vividly metallic reflection on dark areas of the pronotum and elytra and a slightly longer prosternal intercoxal process. Males of these three species are also easily distinguished by the form of the median lobe of their genitalia.

GEOGRAPHICAL DISTRIBUTION.— (Fig. 50). At present, known only from East Africa south of the Equator, from southern Kenya to eastern South Africa, west to southeastern Democratic Republic of the Congo and central Zimbabwe. I examined a total of 59 specimens (29 males and 30 females) from the following localities: **Democratic Republic of the Congo:** Katanga Province (Kalemie [ZMHB]; Kolwezi [BMNH]). **Kenya:** Kitui County (Ikutha [ZMHB]). **Madagascar:** Mahajanga Province (Maevatanana [MNHN]). **Malawi:** Northern Region (5 km S of Chintheche on shore of Lake Malawi [ZMHB]); Southern Region (Mangochi [BMNH]; Zomba [BMNH]); Region unspecified (Lake Malawi [BMNH; ZMHB]). **South Africa:** Eastern Cape Province ([NHRS]). **Tanzania:** Manyara Region (Tarangire National Park [Bawawa La Bata Pond, Mawa ya Mbiti, Fernande's Camp at Tarangire Pool, Mbweha Camp] [all in AMNH]); Rukwa Region (Kasanga [ZMHB]). **Zimbabwe:** Matabeleland South Province (Mbalabala [BMNH]). **Other records:** "Afr. Or. Luitpoldkette" ([BMNH; ZMHB]).

HABITAT DISTRIBUTION.— Label data associated with specimens from Lake Malawi (near Chintheche, see above) indicate that they were collected on the sandy shore of the lake. These beetles probably occur on the open, sandy banks of lakes and rivers in eastern Africa. They are best collected at night when they are active on the dry sand surface of river banks or at lights in the vicinity of such riparian or lacustrine habitats.

Cyclosomus flexuosus (Fabricius)

Carabus flexuosus Fabricius, 1775:246. Type locality: eastern India. Dejean (1831:812); Dupuis (1912:284); Jeannel (1949:876).

Scolytus flexuosus (Fabricius), Fabricius (1790:221; 1792:180).

Cyclosomus dytiscoides Nietner, 1857:312. Type locality: Sri Lanka, Western Province, Negombo.

Cyclosomus flexuosus (Fabricius), Andrewes (1921:153 and 166, 1924:464, 1927:105, 1930:365); Heller (1923:302); Csiki (1932:1295); Lorenz (2005:452).

NOTES ON TYPES AND NOMENCLATURE.— Lectotypes designations for *Carabus flexuosus* and *Cyclosomus dytiscoides* will be provided in a forthcoming paper treating the *Cyclosomus* species of the Oriental Region.

DIAGNOSIS.— Adults of *C. flexuosus* can be distinguished from those of other *Cyclosomus* species in the Afrotropical Region by the following combination of character states: Habitus as in Fig. 11. Size moderate for genus, BL = 9.7 mm. Head and pronotum reddish-brown to dark brown with lateral paler areas broad and slightly broadened basally; elytra mainly pale yellow-tan, darker color pattern (Fig. 11) with middle dark transverse band broad and complete across elytra, con-



FIGURES 10–12. Digital photographs of specimens of *Cyclosomus* species. Fig. 10. *C. equestris* Boheman (Kasanga, Rukwa Region, Tanzania). Fig. 11. *C. flexuosus* (Fabricius) (“Nubia”). Fig. 12. *C. madecassus* Fairmaire (Madagascar). Scale lines = 1.0 mm.

fluent medially with dark interval 1, and expanded along middle half of interval 9, subapical dark spot distinct on intervals 4 and 5; dorsum without metallic reflection. Pronotum (Fig. 21) with anterior angles broadly rounded, lateral margins evenly rounded, not sinuate subapically, with one lateral seta at or anterior to middle on each side, without setae on anterior margin. Prosternal intercoxal process (Fig. 28) long. Elytra (Figs. 11) not or only slightly broader at base than base of pronotum, with humeri sharply angulate. Based on male specimens examined from the Oriental region, I add the following: Male with middle tarsomeres 1 to 3 not laterally expanded and without ventral pads of adhesive setae (as in Fig. 31). Male with median lobe of aedeagus as in Figs. 37 and 44, with shaft thick and abruptly tapered subapically, its ventral margin nearly straight in basal two-thirds, bent ventrally at apically one-third (Fig. 37), exceptionally broad in dorsal view (Fig. 44); apical lamella of moderate length, distinctly recurved dorsally (Fig. 37), with sides evenly parallel basally and then abruptly convergent to narrow, bluntly pointed apex (Fig. 44).

Adults of *C. flexuosus* can be distinguished from those of the other Afrotropical *Cyclosomus* species by the middle transverse dark band of their elytra, which extends from the midline, where it is contiguous with the dark interval 1, to interval 9, where it extends anteriorly and posteriorly on that interval for a total distance equal to half of the elytral length. In the single specimen known from the Afrotropical Region, that band is broad, wavy and unbroken, although some specimens from the Oriental Region have the band thinner and/or discontinuous. The large subapical spot, occupying intervals 4 and 5, is larger than that seen in members of any other species treated here (except for some specimens of *C. rousseaui*, which otherwise, paradoxically, have greatly reduced elytral dark areas).

All external features of the single known Afrotropical specimen, a female, match or are within the range of variation seen among *C. flexuosus* specimens from the Indian Subcontinent. It is unfortunate that, at present, we have no male specimen from the "Nubia" region because the male genitalia in members of this species are easily distinguished from those of all other Afrotropical species, and the appropriateness of my identification could be tested. Of course, it is possible that the specimen examined represents an undescribed species, but in the absence evidence to the contrary, it seems most appropriate to identify it as *C. flexuosus* at this time.

GEOGRAPHICAL DISTRIBUTION.— (Fig. 51.) The geographical range of *C. flexuosus* covers most of the Indian Subcontinent, from the southern base of the Himalayan Mountains in the north to Sri Lanka in the south. Among specimens received on loan from NHRS was a single female specimen labeled "Nubia"/ "Dohrn"/ "6678 E91". The name, "Nubia", has been applied historically to an area including southern Egypt and northern Sudan as far south as just above Khatoum, centered on the Nile River valley. As such, the locality at which this specimen is labeled as having been collected is at least 4000 km west of the nearest other known locality for this species, in the State of Gujarat, India. I have no reason to believe that the specimen is mislabeled, so we need to consider the implications of this record. Although adults of *C. flexuosus* are evidently good fliers, based on several records of capture at lights in India and Sri Lanka, it is hard to imagine an individual covering such a distance on its own. It is also unlikely that this specimen represents a relictual, disjunct population of *C. flexuosus* dating to a period when the range of this species might have included the intervening areas of the Middle East. It is more likely that the "Nubia" specimen either was itself transported by human means directly from the Indian Subcontinent or it represents an adventive population of this species possibly established in that part of northeastern Africa as a result of some prior introduction. Of course if this specimen represents a distinct species, none of the above scenarios would apply. Future collecting, directed at suitable habitats in the region, could establish if such a population exists there currently and whether or not it is conspecific with *C. flexuosus*.

HABITAT DISTRIBUTION.— In the Oriental Region, these beetles occur on the open, sandy banks of rivers and, at least at some localities in Sri Lanka, on sandy upper sea beaches as well. They are best collected at night when they are active on the dry sand surface of river banks or at lights in the vicinity of such riparian habitats.

***Cyclosomus madecassus* Fairmaire**

Cyclosomus madecassus Fairmaire, 1898:222. LECTOTYPE, here designated, a male, in MNHN, labeled: “Madag^r. Superb^{lle} H. Perrier” [white label with black outlining box]/ “TYPE” [red label]/ “*Cyclosomus madecassus* Fairmaire” [handwritten]/ “LECTOTYPE *Cyclosomus madecassus* Fairmaire, 1898, design. by D.H. Kavanaugh 2015” [red label]. Type locality: Madagascar, Mahajanga Province, Maevatanana. Dupuis (1912:284); Csiki (1932:1295); Jeannel (1949:875); Lorenz (2005:452).

NOTES ON TYPES AND NOMENCLATURE.— Although I have not seen the lectotype specimen, label data from it cited above were provided by A. Taghavian (MNHN), and my lectotype label has been added to that specimen.

DIAGNOSIS.— Adults of *C. madecassus* can be distinguished from those of other *Cyclosomus* species in the Afrotropical Region by the following combination of character states: Habitus as in Fig. 12. Size moderate for genus, BL = 8.4–9.3 mm. Head dark reddish-brown to piceous; pronotum reddish-brown to piceous with lateral pale areas broad anteriorly and slightly broadened basally; elytra mainly pale yellow-tan, darker color pattern (Fig. 12) with medial basal area and interval 1 dark brown to piceous, middle transverse dark band dark brown to piceous, W-shaped, extended laterally only to interval 5 or 6, thin or discontinuous, subapical dark spot absent; dark areas of pronotum and elytra with very faint metallic green reflection. Pronotum (Fig. 22) relatively broad, ratio WPB/LP = 2.35–2.41 (mean = 2.37; n = 3), anterior angles moderately rounded, lateral margins evenly rounded, not or only faintly sinuate subapically, with one lateral seta at or anterior to middle on each side, without setae on anterior margin. Prosternal intercoxal process (Fig. 29) short. Elytra (Fig. 11) not or only slightly broader at base than base of pronotum, with humeri sharply angulate. Male with middle tarsomeres 1 to 3 not laterally expanded and without ventral pads of adhesive setae (see Fig. 31). Male with median lobe of aedeagus as in Figs. 38 and 45, with shaft thick and abruptly tapered subapically, its ventral margin nearly straight in apical half (Fig. 38), very slightly offset right at apical third in dorsal view (Fig. 45); apical lamella short, slightly deflected ventrally (Fig. 38), with sides evenly convergent to broadly and roundly pointed apex (Fig. 45).

Adults of *C. madecassus* are most similar in habitus to those of *C. buquetii* and *C. equestris*. They have much less vivid metallic reflection on dark areas of the pronotum and elytra than members of either of the other species. They differ from members of *C. buquetii* also in being larger and having a much shorter prosternal intercoxal process. From members of *C. equestris*, they also differ in having a relatively broader pronotum with more broadly rounded anterior angles and a lateral pronotal pale band that is distinctly broader anteriorly. Males of these three species are also easily distinguished by the form of the median lobe of their genitalia.

GEOGRAPHICAL DISTRIBUTION.— (Fig. 52.) Known only from a few localities in Madagascar. Jeannel (1949) recorded specimens from the Atsimo-Andrefana (Onilany River at Betroka) and Mahajanga (shore of Ikopa River near Maevatanana) Regions. I examined a total of 3 specimens (1 male and 2 females) from the following localities: Mahajanga Region (25 km SW of Ambalanjanakomby [NMNH]); “Madag.” ([BMNH]); “Madagascar” ([BMNH]), both without specific locality.

HABITAT DISTRIBUTION.— Specimens of this species have been collected on the open sandy

shores of rivers at up to 800 m elevation (Betroka), and they are likely to occur in such habitats over much of Madagascar. They are best collected at night when they are active on the dry sand surface of river banks or at lights in the vicinity of such riparian habitats.

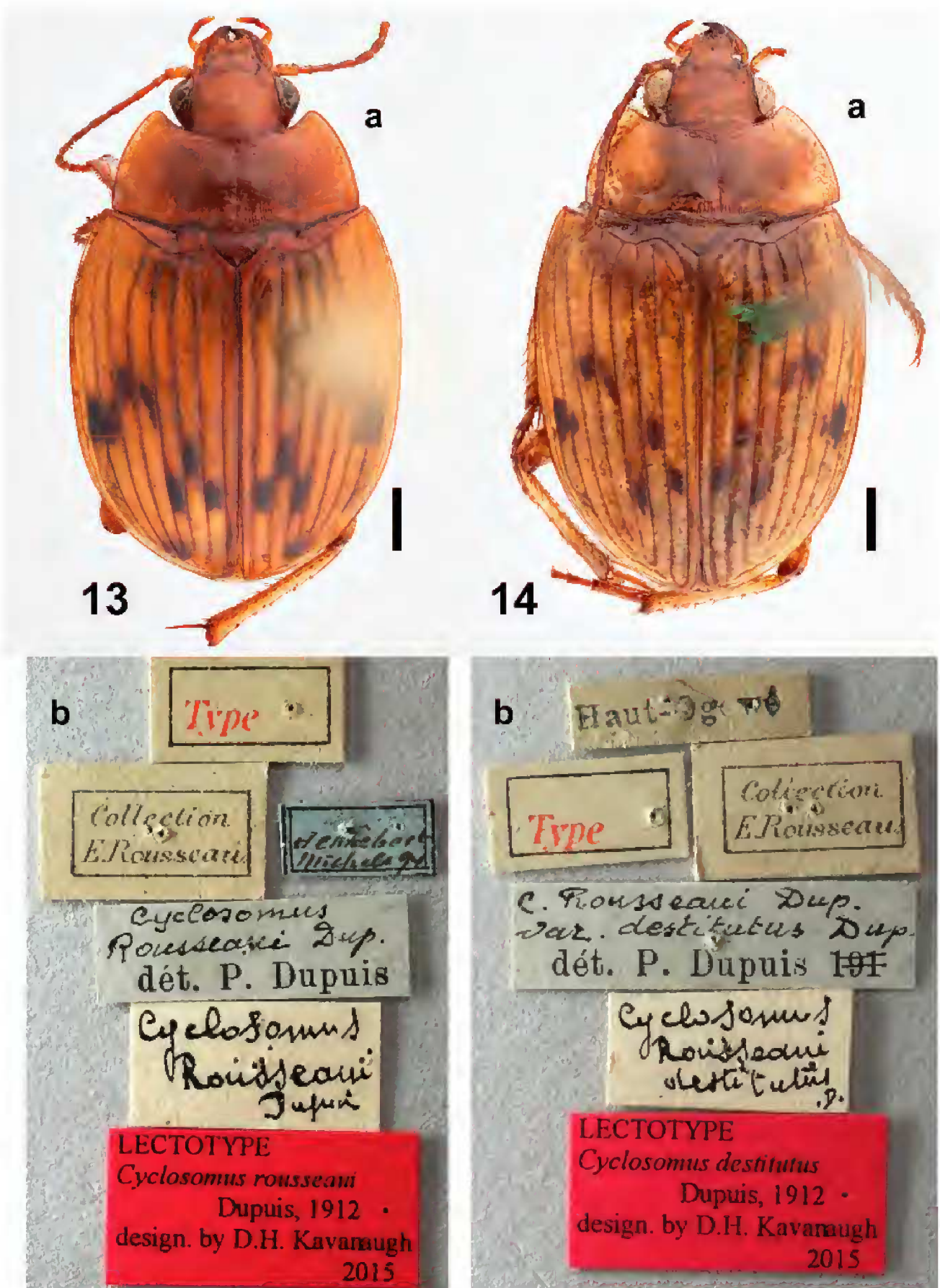
Cyclosomus rousseai Dupuis

Cyclosomus rousseai Dupuis, 1912:385. LECTOTYPE (Fig. 13), here designated, a male, in IRSNB, labeled: “Type” [red ink on white paper with black outlining box]/ “Hennebert, Michela 94” [handwritten on blue paper with black outlining box]/ “Collection E. Rousseau”/ “Cyclosomus Rousseai Dup. det. P. Dupuis” [pale grey label]/ “Cyclosomus Rousseai Dupuis” [handwritten]/ “LECTOTYPE *Cyclosomus rousseai* Dupuis, 1912, design. by D.H. Kavanaugh 2015” [red label]. Paralectotypes examined: 1 female, also in IRSNB, labeled: “Type” [handwritten]/ “Congo Belge” [handwritten]/ “Hennebert, M. 94” [handwritten on blue paper with black outlining box]/ “Cyclosomus Rousseai Dup. det. P. Dupuis” [pale grey label]/ “Cyclosomus Rousseai Dupuis” [handwritten]/ “PARALECTOTYPE *Cyclosomus rousseai* Dupuis, 1912, design. by D.H. Kavanaugh 2015” [yellow label]. Type locality: Democratic Republic of the Congo (without specific locality). Burgeon (1931:308); Csiki (1932:1295); Alluaud (1935:11); Lorenz (2005:452).

Cyclosomus rousseai destitutus Dupuis, 1912:388. LECTOTYPE (Fig. 14), here designated, a male, in IRSNB, labeled: “Haut-Ogowé”/ “Collection E. Rousseau”/ “Type” [red ink on white paper with black outlining box]/ “Cyclosomus Rousseai Dup. var. destitutus Dup. det. P. Dupuis ~~191~~” [pale grey label]/ “LECTOTYPE *Cyclosomus destitutus* Dupuis, 1912, design. by D.H. Kavanaugh 2015” [red label]. Paralectotypes examined: 1 female, in IRSNB, labeled: “Type” [handwritten in red ink on white paper]/ “Haut-Ogowé”/ “Cyclosomus Rousseai Dup. det. P. Dupuis” [pale grey label]/ “Cyclosomus Rousseai D. var. destitutus D.” [handwritten]; 1 female, also in IRSNB, labeled: “Louloua Congo” [handwritten]/ “Collection E. Rousseau”/ “Type” [red ink on white paper with black outlining box]/ “Cyclosomus Rousseai Dup. var. destitutus Dup. det. P. Dupuis ~~191~~” [pale grey label]. Each paralectotype also bears the following label: “PARALECTOTYPE *Cyclosomus destitutus* Dupuis, 1912, design. by D.H. Kavanaugh 2015” [yellow label]. Type locality: Gabon, Haut-Ogooué Province. Burgeon (1931:308); Lorenz (2005:452).

NOTES ON TYPES AND NOMENCLATURE.—Dupuis (1912) distinguished members of his “variety” *C. rousseai destitutus* from those of the nominate form based the absence (Fig. 14) of the subapical dark spot from each elytron seen in *C. rousseai* s. str. (Fig. 13). For some of the species in which the subapical dark spot occurs at all, it is inconsistent, present or absent in different individuals in the same population and/or from different localities, depending on the species. The precise locality within “Congo Belge” (now the Democratic Republic of the Congo) at which the type series of *C. rousseai* was collected is unknown, whereas specimens exhibiting the *destitutus* morph occur through the range of the species, including in the Democratic Republic of the Congo. Because the male lectotypes for both names have similar genitalia and there is no apparent allopatry between the two forms, I see no reason to retain *C. rousseai destitutus* as a separate subspecies and therefore consider them synonyms.

DIAGNOSIS.—Adults of *C. rousseai* can be distinguished from those of other *Cyclosomus* species in the Afrotropical Region by the following combination of character states: Habitus as in Figs. 13–14. Size small to moderate for genus, BL = 7.6–8.4 mm. Head and pronotum pale yellow-tan to pale reddish brown, lateral paler areas slightly to moderately broad and slightly broadened basally; elytra mainly pale yellow-tan, darker color pattern (Figs. 13–14) with interval 1 not or only slightly darker than pale sections of other intervals, base pale reddish-brown medially, middle transverse dark band reddish-brown to piceous, W-shaped, extended laterally to full-width of interval 8, thin or discontinuous and present only as isolated spots (including interval 8 in all specimens), subapical dark spot present or absent; dorsum without metallic reflection. Pronotum (Fig. 23) with anterior angles broadly to moderately rounded or broadly pointed, lateral margins not sin-



FIGURES 13–14. Type specimens of *Cyclosomus* species; a, digital photograph of dorsal habitus; b, specimen labels. Fig. 13. *C. rousseaui* Dupuis, lectotype male. Fig. 14. *C. destitutus* Dupuis, lectotype male. Scale lines = 1.0 mm.

uate subapically, with one lateral seta at or anterior to middle on each side, without setae on anterior margin. Prosternal intercoxal process (Fig. 30) medium-length or long. Elytra (Figs. 13–14) not or only slightly broader at base than base of pronotum, with humeri sharply angulate. Male with middle tarsomeres 1 to 3 not laterally expanded and without ventral pads of adhesive setae (see Fig. 31). Male with median lobe of aedeagus as in Figs. 39 and 46, with shaft gradually tapered apically, its ventral margin arcuate basally, nearly straight in medial third and ventrally deflected apically (Fig. 39), slightly offset right at apical third in dorsal view (Fig. 46); apical lamella very long, straight, slightly constricted basally and broadly rounded apically (Fig. 46).

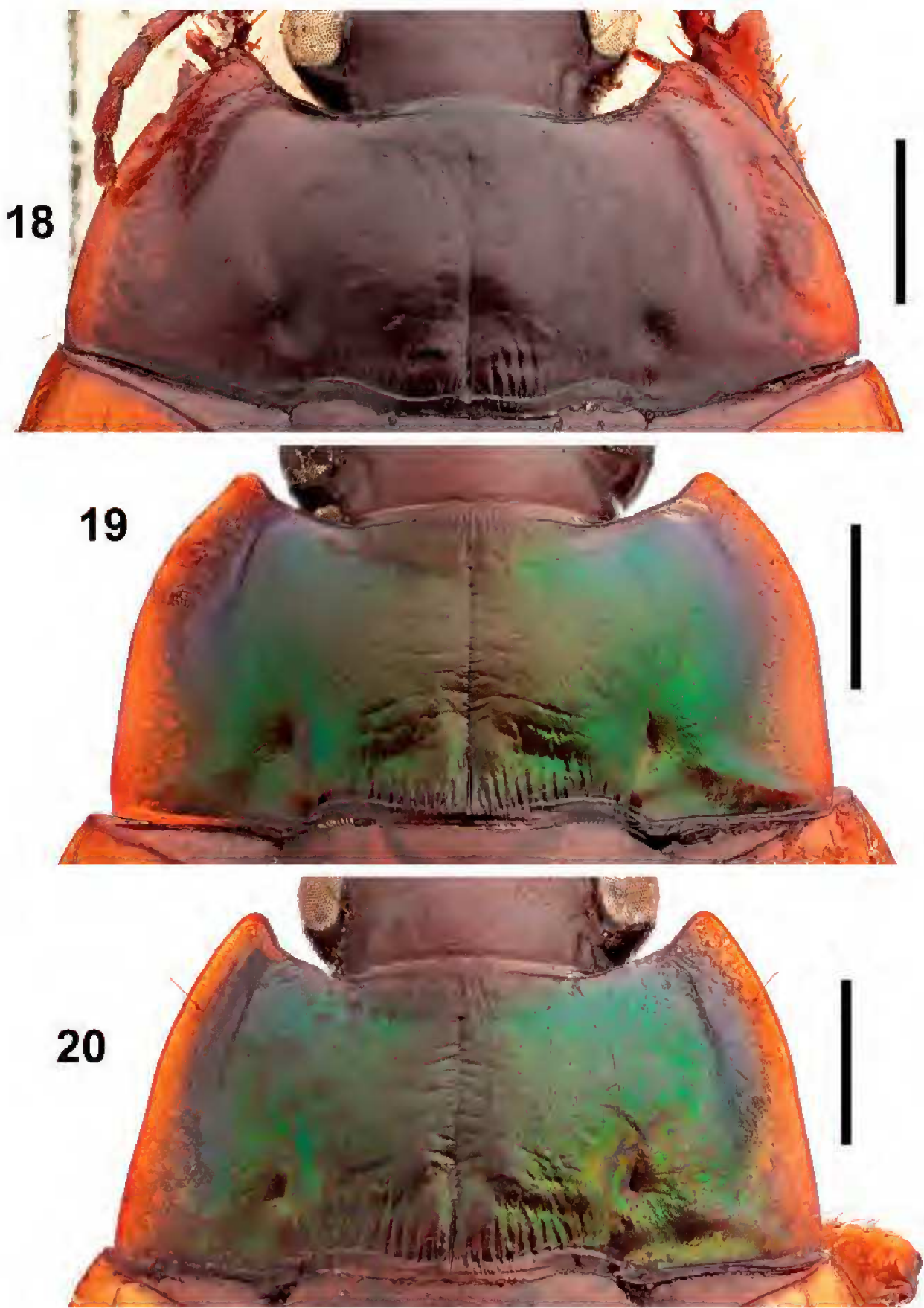
Adults of *C. rousseaui* can be distinguished from those of all other *Cyclosomus* species in the Afrotropical Region in having the middle transverse dark band of their elytra fragmented into several small, unconnected patches or spots, varied in their darkness, but including, in all specimens examined, a darker spot occupying the full width of interval 8 and part or all of interval 7. Members of no other species have a spot or band that extends to the lateral edge of interval 8 except those of *C. flexuosus*, in which the band is broad and continuous onto interval 9. The pronotum is pale, even paler than in *C. collarti* or *C. flexuosus* members, and, as with them, the dorsum is without a trace of metallic reflection.

GEOGRAPHICAL DISTRIBUTION.— (Fig. 53.) Widespread across Sub-Saharan Africa. Known from scattered localities in the north from Sierra Leone to southern Sudan, in the south from Gabon and Democratic Republic of the Congo, not yet recorded from East Africa or southern Africa. I examined a total of 13 specimens (5 males and 8 females) from the following localities: **Democratic Republic of the Congo:** Kasai Oriental Province (Sankuru [ZMHB]); Katanga Province (Lodja [IRSNB]; Lualaba [IRSNB]). **Gabon:** Haut-Ogooué Province ([IRSNB]). **Sierra Leone:** Southern Province (Njala [BMNH]). **Sudan:** Sennar State (Abu Tiga [BMNH]). **Other records:** “W. Africa” ([BMNH]).

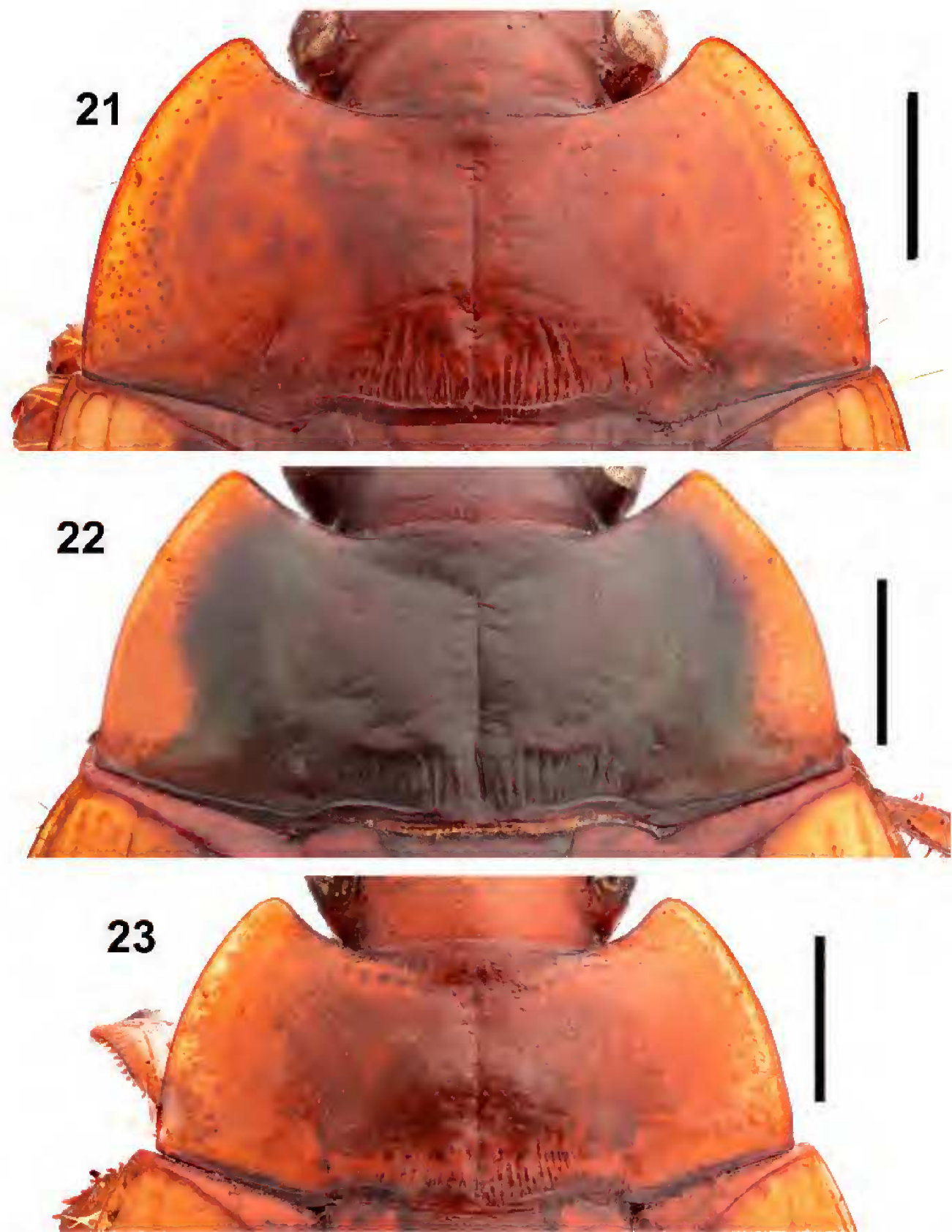
HABITAT DISTRIBUTION.— None of the specimens examined had associated habitat data. However, it most likely that members of this species, like those of all other species in the genus, occur on open sandy shores of rivers in the geographical region noted above. They are best collected at night when they are active on the dry sand surface of river banks or at lights in the vicinity of such riparian habitats.



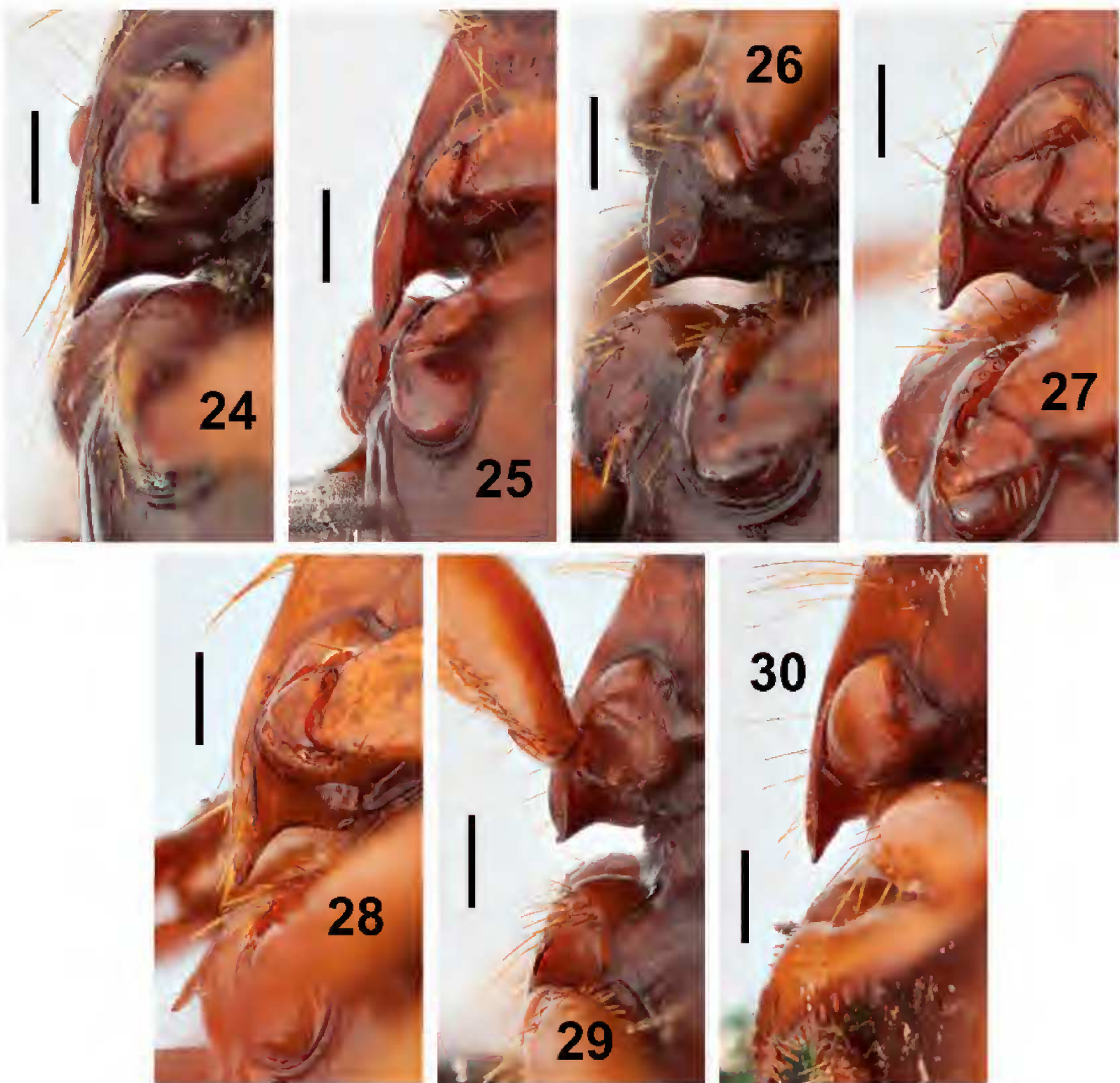
FIGURES 15–17. Digital photographs of prothoraces of *Cyclosomus* species, dorsal aspect. Fig. 15. *C. basalis* Kolbe (lectotype). Fig. 16. *C. buquetii* Dejean (lectotype). Fig. 17. *C. collarti* Burgeon (holotype). Scale lines = 1.0 mm.



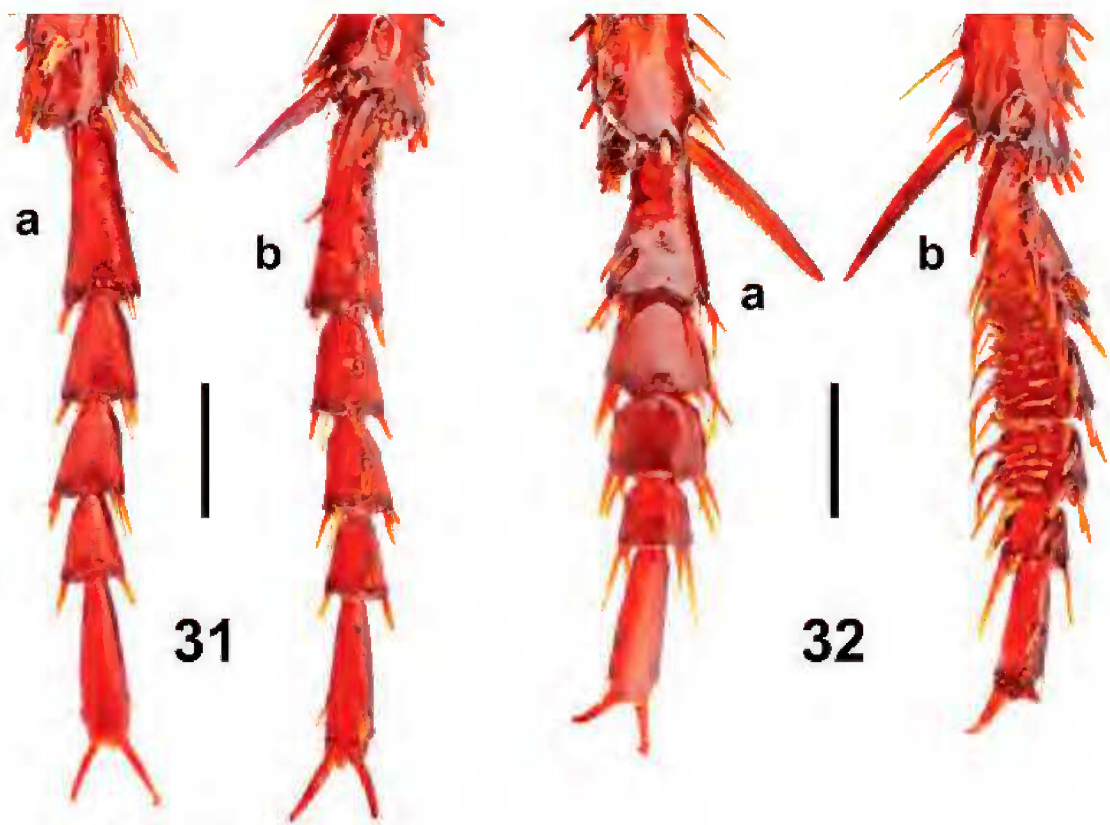
FIGURES 18–20. Digital photographs of prothoraces of *Cyclosomus* species, dorsal aspect. Fig. 18. *C. somalicus* Alluaud (lectotype). Fig. 19. *C. equestris* Boheman (lectotype). Fig. 20. *C. equestris* Boheman (Kasanga, Rukwa Region, Tanzania). Scale lines = 1.0 mm.



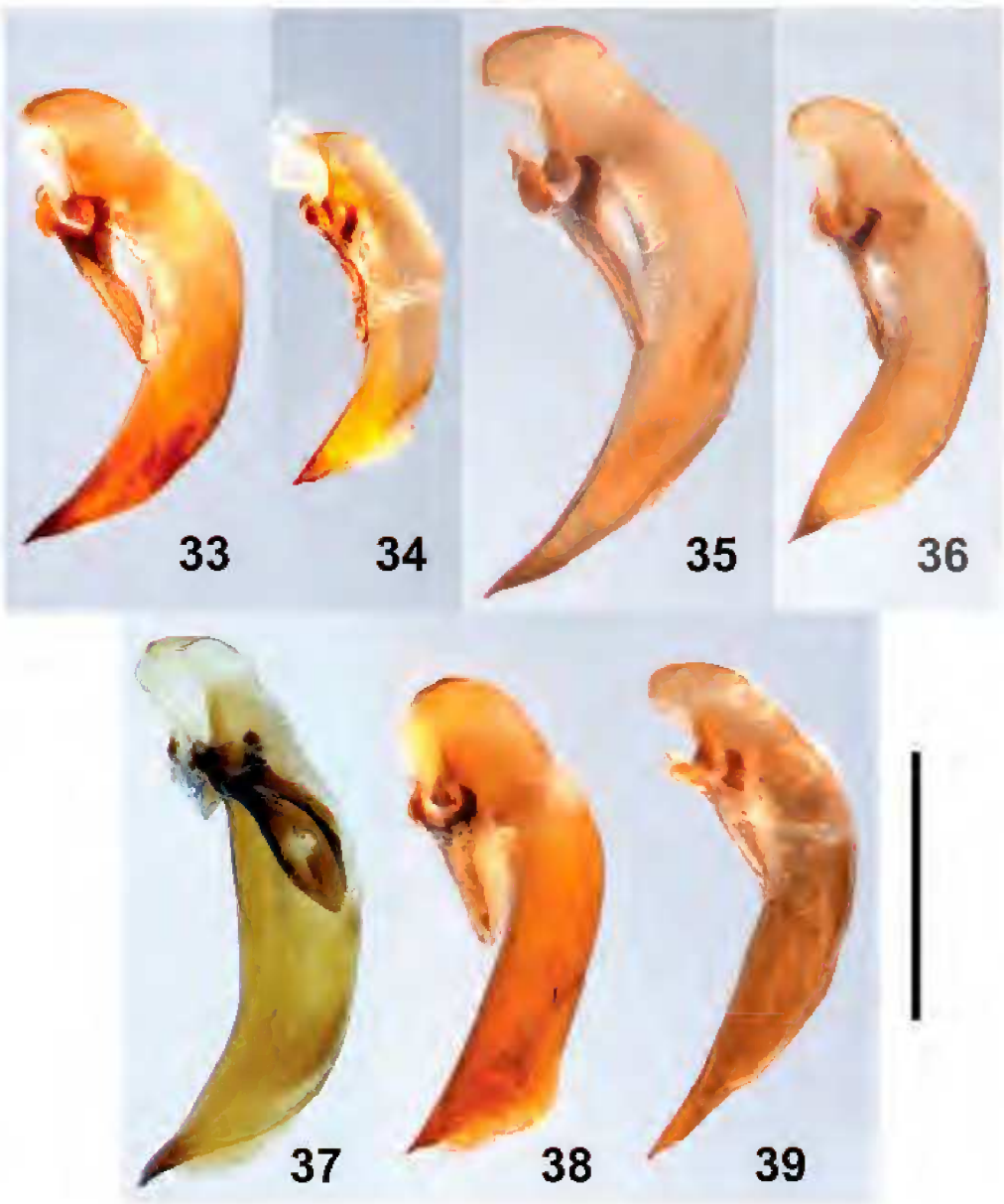
FIGURES 21–23. Digital photographs of prothoraces of *Cyclosomus* species, dorsal aspect. Fig. 21. *C. flexuosus* (Fabricius) (“Nubia”). Fig. 22. *C. madecassus* Fairmaire (Madagascar). Fig. 30. *C. rousseaui* Dupuis (lectotype). Scale line = 1.0 mm.



FIGURES 24–30. Digital photographs of thoracic venters showing relative length of prosternal intercoxal process of *Cyclosomus* species, left lateral oblique view. Fig. 24. *C. basalis* Kolbe (5 km S of Chintheche on shore of Lake Malawi, Northern Region, Malawi). Fig. 25. *C. buquetii* Dejean (Beira, Sofala Province, Mozambique). Fig. 26. *C. collarti* Burgeon (Lac Albert, Ituri Province, Democratic Republic of the Congo). Fig. 27. *C. equestris* Boheman (5 km S of Chintheche on shore of Lake Malawi, Northern Region, Malawi). Fig. 28. *C. flexuosus* (Fabricius) (“Nubia”). Fig. 29. *C. madecassus* Fairmaire (25 km SW of Ambalanjanakomby, Mahajanga Region, Madagascar). Fig. 30. *Cyclosomus rousseaui* Dupuis (Njala, Northern Province, Sierra Leone). Scale line = 0.5 mm.



FIGURES 31–33. Digital photographs of male middle tarsi of *Cyclosomus* species; a, dorsal view; b, ventral view. Fig. 31. *C. equestris* Boheman (Ikutha, Kitui County, Kenya). Fig. 32. *C. collarti* Burgeon (Lac Albert, Ituri Province, Democratic Republic of the Congo). Scale line = 0.5 mm.



FIGURES 33–39. Digital photographs of male median lobe of aedeagus of *Cyclosomus* species, left lateral view. Fig. 33. *C. basalis* Kolbe (50–70 km W of Iringa, Tanzania). Fig. 34. *C. buquetii* Dejean (Beira, Sofala Province, Mozambique). Fig. 35. *C. collarti* Burgeon (Lac Albert, Ituri Province, Democratic Republic of the Congo). Fig. 36. *C. equestris* Boheman (5 km S of Chintheche on shore of Lake Malawi, Northern Region, Malawi). Fig. 37. *C. flexuosus* (Fabricius) (“eastern India”). Fig. 38. *C. madecassus* Fairmaire (Madagascar). Fig. 39. *C. rousseaui* Dupuis (Abu Tiga, Sennar State, Sudan). Scale line = 1.0 mm.



FIGURES 40–46. Digital photographs of male median lobe of aedeagus of *Cyclosomus* species, dorsal view in plane of apical orifice. Fig. 40. *C. basalis* Kolbe (50–70 km W of Iringa, Tanzania). Fig. 41. *C. buquetii* Dejean (Beira, Sofala Province, Mozambique). Fig. 42. *C. collarti* Burgeon (Lac Albert, Ituri Province, Democratic Republic of the Congo). Fig. 43. *C. equestris* Boheman (5 km S of Chintheche on shore of Lake Malawi, Northern Region, Malawi). Fig. 44. *C. flexuosus* (Fabricius) (“eastern India”). Fig. 45. *C. madecassus* Fairmaire (Madagascar). Fig. 46. *C. rousseaui* Dupuis (Abu Tiga, Sennar State, Sudan). Scale line = 1.0 mm.

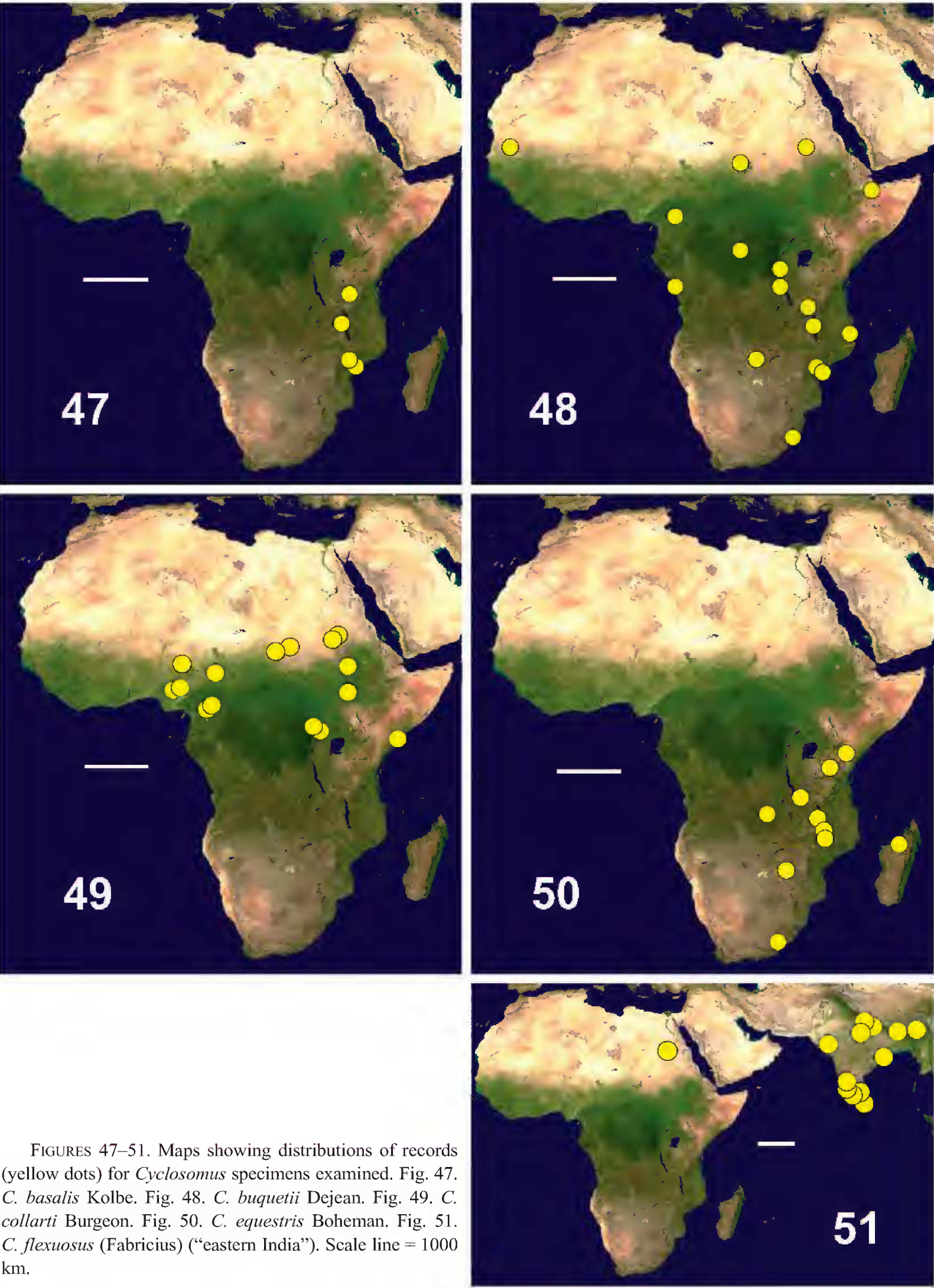
DISCUSSION

GEOGRAPHICAL DISTRIBUTION PATTERNS.— Even a quick glance at the maps illustrating the distributions of samples of the *Cyclosomus* species treated here (Fig. 47–53) reveals how little really is known about the distributions of species in the vast expanse of the Afrotropical Region. Some of these species, such as *C. buquetii* and *C. rousseaui*, range west to east across most of the continent and north to south across the Equator, but with huge gaps between recorded localities. Two species, *C. collarti* and *C. equestris*, have large geographical ranges but apparently only northward and southward from the Equator, respectively. *Cyclosomus basalis* and *C. equestris* appear to be restricted to eastern Africa south of the Equator, the former to a narrow zone extending from central Tanzania to coastal Mozambique near the mouth of the Zambesi River, the latter more broadly ranging, south to South Africa and east to Madagascar. One species, *C. madecassus* is known only from Madagascar. Three species, *C. buquetii*, *C. collarti* and *C. rousseaui*, have ranges that penetrate the southern edge of the Saharan zone along major rivers. The record for *C. flexuosus* from “Nubia”, farther north than any record for another species in the Afrotropical Region, is discussed above in the treatment of that species. Much additional collecting will be required to better understand the geographical ranges of these species and set a baseline against which potential changes in those distributions as a result of climate change can be tracked.

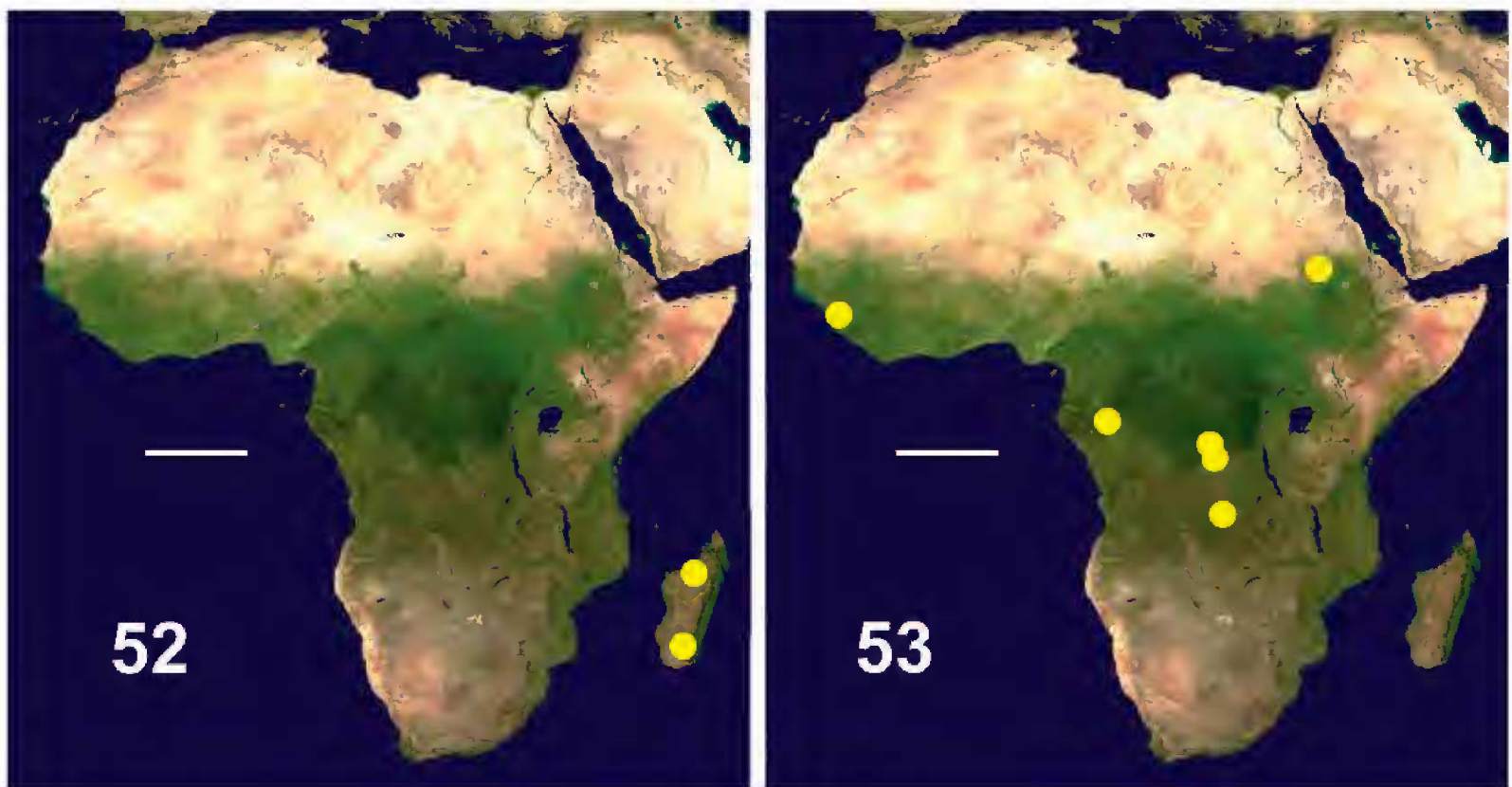
SYMPATRY AND SYNTOPY AMONG SPECIES.— Available evidence suggests that all *Cyclosomus* species prefer similar habitats, namely the open and exposed sandy margins of mid- to large-size streams and of large lakes. Given their shared habitat preferences, the extensive known geographical ranges of some of the species and the broad overlap of the their ranges, both sympatry (i.e., co-occurrence in the same region) and syntopy (i.e., co-occurrence at the same site in the same habitat) should be expected. In general, distributional sampling of *Cyclosomus* species to date has been so sparse within their ranges, that sympatry and syntopy have not been well documented. However, a few instances of co-occurrence are documented with the specimens available.

Adults of *C. buquetii* and *C. collarti* have been collected together at two localities in Sudan: at Bahr el Abiad (Khartoum State) and at El Geneina (West Darfur State); and adults of *C. basalis*, *C. buquetii* and *C. equestris* were found together on a sandy beach on the western shore of Lake Malawi, 5 km south of Chintheche (Northern Region), Malawi. These are the only documented instances of syntopy of which I am aware, but additional sampling is likely to demonstrate far greater co-occurrence of *Cyclosomus* species. The geographical range of *C. buquetii* overlaps all or part of the range of each of the other Afrotropical species except *C. flexuosus*, so it is likely sympatric with each of those other species in at least part of its range. *Cyclosomus basalis* is sympatric with *C. buquetii* and *C. equestris* in Malawi and probably in other parts of its range. *Cyclosomus collarti* is sympatric with *C. buquetii* in Sudan and probably throughout central Africa north of the Equator, and perhaps with *C. rousseaui* in these same general areas. *Cyclosomus equestris* is sympatric with *C. basalis* and *C. buquetii* in Malawi and with *C. madecassus* at least in northwestern Madagascar. Although it has not yet been found co-occurring with any other *Cyclosomus* species, the range of *C. rousseaui* overlaps broadly with those of *C. buquetii* and *C. collarti* and very slightly with that of *C. equestris* in the southern part of the Democratic Republic of the Congo. Otherwise, the ranges of *C. rousseaui* and *C. equestris* are allopatric or perhaps parapatric.

It is my hope that the information provided in this report, and particularly the key for identification of species, will both stimulate and facilitate future work with *Cyclosomus* species in Africa.



FIGURES 47–51. Maps showing distributions of records (yellow dots) for *Cyclosomus* specimens examined. Fig. 47. *C. basalis* Kolbe. Fig. 48. *C. buquetii* Dejean. Fig. 49. *C. collarti* Burgeon. Fig. 50. *C. equestris* Boheman. Fig. 51. *C. flexuosus* (Fabricius) ("eastern India"). Scale line = 1000 km.



FIGURES 52–53. Maps showing distributions of records for *Cyclosomus* specimens examined. Fig. 52. *C. madecassus* Fairmaire. Fig. 53. *C. rousseaui* Dupuis. Scale line = 1000 km.

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